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V.

Discussion of the Observations of the Great Comet of 1858, with the Object of determining the most probable Orbit.

By G. W. HILL.

Communicated by T. H. Safford, April 12, 1864.

THE interesting physical aspect of this comet attracted the attention of astronomers to it in an unusual degree, a large part of which was expended in obtaining observations for position. Consequently, we have a large mass of material for determining its orbit, not a little of which is of very good quality. Added to this, the quite long period of the apparition of the comet (nine months), would enable us to obtain the elements with considerable precision. Moreover, hints were thrown out that some other force besides gravity might effect its motion. Although these seem to have had no foundation other than the fact that the orbits derived from three normals did not well represent the intermediate observations, yet it is a matter of some interest to clear up the suspicion.

As the first step in the work, I determined to reduce the observations to uniformity, in respect to the places adopted for the comparison stars; which last I proposed to derive from all the material accessible to me. The desirableness of this course is evident when we consider that the observers at Bonn, Kremsmünster, Ann Arbor, and the two observatories in the southern hemisphere reobserved their comparison stars, in consequence of which their observations agree much better among themselves; while the rest contented themselves with places from Lalande, Bessel's Zones, or the British Association Catalogue, and their results exhibit larger probable errors. And as the comet was observed nearly simultaneously in Europe, the same comparison star was frequently used by a dozen observatories for the same night's work; and thus the stars of the latter class of observatories mentioned above are often found among those reobserved by the former. The result of this labor has convinced

me that it has not been wasted; the good effect is apparent, particularly in the Liverpool and Gottingen observations.

A catalogue of all the stars used for comparison having been formed, the following authorities were consulted for material:—

Baily's Lalande, Piazzì, Bessel's Zones (Weisse's Reduction), Struve Catalogus Generalis, Taylor, Rümker, Argelander's Southern Zones (Oeltzen), Robinson's Armagh Catalogue, Johnson's Radcliffe Catalogue, Greenwich Twelve Year and Six Year Catalogues, Mädler, Greenwich Observations, 1854–60, Henderson Edinburgh Observations, Challis Cambridge Observations, Leverrier Paris Observations, 1856–59.

Leverrier commenced, in 1856, to reobserve the stars of Lalande; hence quite a number of the stars the observers had taken from this source, were found in the Paris Observations. The searching them out and reducing them entailed considerable labor. In addition to the material before mentioned, that furnished by the observatories at which the comparison stars were reobserved, was, of course, not omitted.

All this material was reduced to 1858.0, and to the standard of Wolfer's Tabulæ Reductionum, by applying the systematic corrections given by Auwers, in Astr. Nachr., No. 1300, with the modifications suggested by Mr. Safford, in No. 1368. The systematic corrections for Robinson are found in Astr. Nachr. No. 1408. Also, the following, kindly furnished by Mr. Safford, were employed:

	R. A.	DEC.
Greenwich Six Year Catalogue, . . .	+0 ^s .017	
Greenwich Observations, 1854–60, . . .	+0.027	+0 ^m .70
Paris Observations, 1856–59, . . .	+0.056	+0.19

In a few cases, mostly Piazzì stars, where the observations indicated proper motion, it was taken into account. With regard to the stars used in the southern observations, those common to the northern being excepted, they were retained without change, or when the same star had been used at both observatories, the observations were combined, allowing a weight of 3 to the Cape and of 2 to the Santiago observation. However, the place of the Santiago star No. 57, equivalent to Cape No. 95, is wrong, seemingly an error of reduction; hence the Cape place has been adopted. And Santiago, No. 49, differing 7^m.5, in declination, from its equivalent, Cape No. 87, the Cape declination appearing the better, has been retained.

Number.	α 1858.0.	δ 1858.0.	Number.	α 1858.0.	δ 1858.0.
	^h ^m ^s	[°] ['] ^{''}		^h ^m ^s	[°] ['] ^{''}
1	9 11 35.277	+25 0 59.98	57	10 47 51.964	+34 15 49.07
2	9 23 19.992	25 2 12.96	58	10 52 35.910	35 13 36.25
3	9 25 52.434	24 5 6.93	59	10 56 35.054	35 7 11.70
4	9 29 26.949	25 1 49.81	60	10 59 36.820	35 36 32.64
5	9 29 41.987	25 18 21.93	61	11 0 45.884	35 29 1.63
6	9 30 47.635	26 34 35.94	62	11 1 29.939	37 4 43.39
7	9 32 23.230	26 38 48.99	63	11 1 58.610	35 40 37.52
8	9 33 27.857	26 33 26.79	64	11 2 24.790	36 6 12.73
9	9 37 42.094	27 41 55.28	65	11 4 16.855	35 46 40.87
10	9 37 47.087	24 25 33.49	66	11 4 37.860	35 33 27.80
11	9 38 33.273	27 34 38.43	67	11 10 16.610	36 13 5.54
12	9 38 42.482	27 48 43.19	68	11 10 48.100	33 52 6.00
13	9 44 17.169	28 26 25.61	69	11 11 4.961	36 15 52.34
14	9 45 49.118	28 21 41.66	70	11 13 48.264	36 25 24.60
15	9 45 51.470	27 57 29.24	71	11 14 24.766	36 6 48.63
16	9 46 34.633	28 1 10.89	72	11 17 49.011	35 56 46.68
17	9 48 45.001	28 46 15.38	73	11 19 30.334	36 32 58.19
18	9 49 3.501	29 14 1.93	74	11 20 16.048	36 9 7.63
19	9 50 10.023	29 15 28.20	75	11 22 8.300	36 25 12.10
20	9 51 24.453	30 19 26.44	76	11 27 39.248	36 11 24.50
21	9 53 8.109	29 27 50.85	77	11 28 14.746	36 42 40.78
22	9 56 54.727	30 26 9.00	78	11 29 52.400	36 23 30.10
23	9 58 59.212	30 12 16.94	79	11 30 28.154	36 23 31.78
24	10 3 36.641	30 50 50.42	80	11 31 6.811	36 23 1.60
25	10 6 0.703	32 7 41.13	81	11 33 33.925	35 0 12.15
26	10 6 56.647	32 10 17.05	82	11 38 8.137	36 40 53.08
27	10 8 9.965	30 0 58.15	83	11 41 22.161	35 37 17.78
28	10 9 27.359	31 35 38.88	84	11 42 18.698	35 43 13.14
29	10 9 50	31 8 36	85	11 48 39.684	36 7 52.28
30	10 10 27.200	31 19 36.16	86	11 48 57.507	36 14 16.51
31	10 12 33.258	32 8 25.35	87	11 54 23.109	36 50 12.34
32	10 12 45.450	31 22 26.94	88	11 55 23.490	36 31 5.11
33	10 14 12.375	32 15 26.28	89	11 57 25.064	36 21 29.55
34	10 14 47.246	31 2 47.57	90	11 59 22.626	36 7 52.04
35	10 14 56.648	31 33 9.66	91	12 8 41	36 2
36	10 16 57.222	31 5 41.78	92	12 9 21.473	33 51 20.73
37	10 23 37.058	31 46 9.62	93	12 14 5.054	35 28 35.44
38	10 23 47.154	33 6 25.56	94	12 18 0.818	35 33 5.54
39	10 25 56.094	33 14 35.93	95	12 23 36.015	34 32 7.24
40	10 26 29.210	32 24 43.22	96	12 24 3.679	34 40 32.25
41	10 27 27.290	32 30 36.72	97	12 24 38.593	34 42 4.90
42	10 29 41.545	33 28 13.95	98	12 26 38.907	34 1 58.92
43	10 29 46.127	33 25 30.26	99	12 30 5.468	33 48 31.59
44	10 30 43.132	32 42 45.11	100	12 40 14.318	33 20 42.67
45	10 34 4.401	33 53 25.44	101	12 44 8.808	32 15 8.42
46	10 34 13.347	32 26 21.00	102	12 48 56.000	32 46 19.64
47	10 35	34 10	103	12 49 22.827	39 5 10.26
48	10 35 11.612	34 6 20.68	104	12 53 28.505	31 33 8.05
49	10 36 27.312	33 21 49.84	105	12 53 38.459	32 32 45.83
50	10 37 50.279	33 20 33.31	106	12 55 34.619	31 7 17.08
51	10 38 50.569	34 18 20.60	107	12 57 5.635	31 31 16.16
52	10 39 45.817	34 20 17.23	108	12 57 16	31 14
53	10 44 6.512	32 7 11.86	109	12 57 26.035	30 58 58.19
54	10 44 8.277	33 47 57.50	110	12 59 23.612	29 47 28.59
55	10 45 21.594	34 58 45.71	111	13 0 21.817	28 23 16.41
56	10 47 3.944	+34 47 31.18	112	13 2 21.623	+31 0 9.03

Number.	α 1858.0.	δ 1858.0.	Number.	α 1858.0.	δ 1858.0.
	^h ^m ^s	[°] ['] ["]		^h ^m ^s	[°] ['] ["]
113	13 2 45.467	+31 11 36.59	169	15 20 44.108	+ 0 23 21.61
114	13 7 53.393	30 9 19.48	170	15 23 56.400	- 0 14 16.79
115	13 9 5.077	30 5 55.53	171	15 30 20.818	3 7 57.60
116	13 10 14.299	29 47 44.00	172	15 33 46.943	3 31 59.42
117	13 12 20.788	29 18 25.90	173	15 37 0.458	- 3 23 9.11
118	13 18 20.109	24 35 44.78	174	15 37 16.575	+ 6 52 30.92
119	13 20 10.842	26 59 50.88	175	15 41 30.788	- 3 22 46.67
120	13 21 46.769	28 5 9.80	176	15 43 44.425	+ 4 54 29.08
121	13 22 2.800	29 11 20.02	177	15 44 11.680	- 7 36 47.93
122	13 23 8.620	28 24 36.87	178	15 44 33	6 53
123	13 23 45.303	28 23 16.90	179	15 46 54.770	7 40 54.50
124	13 25	28 20	180	15 52 4.738	6 53 37.22
125	13 30 3.869	26 36 19.12	181	15 52 26.783	6 42 53.62
126	13 33 22.650	26 38 49.62	182	15 53 7.954	8 0 23.10
127	13 37 33.182	26 0 5.60	183	15 55 1.103	10 13 57.47
128	13 40 7.651	26 24 59.35	184	15 56 33.959	10 58 40.88
129	13 44 19.729	24 20 51.41	185	16 0 21.617	13 22 56.05
130	13 45 56.310	24 15 58.17	186	16 0 41.310	9 42 57.87
131	13 46 12.072	24 2 8.33	187	16 2 59.572	14 0 27.35
132	13 46 46.651	24 51 40.80	188	16 3 6.618	13 36 59.00
133	13 51 39.354	24 38 30.49	189	16 4 24.098	13 22 3.31
134	13 51 59.705	22 23 26.35	190	16 4 41.570	10 6 50.01
135	13 54 25.217	22 39 58.50	191	16 5 42.980	12 40 2.27
136	13 55 20.693	22 14 33.72	192	16 5 59.266	16 22 13.69
137	14 7 56.650	19 9 59.50	193	16 6 12.084	13 37 42.35
138	14 9 11.160	19 55 24.82	194	16 6 29.082	10 3 1.35
139	14 9 23.644	19 34 29.31	195	16 6 59.660	14 16 29.96
140	14 11 14.667	19 6 2.59	196	16 8 32.770	13 17 23.70
141	14 13 2.053	16 57 35.06	197	16 10 3.544	13 5 23.42
142	14 17 27.790	16 55 11.16	198	16 11 34.281	16 8 19.19
143	14 20 0.953	17 3 22.25	199	16 14 44.967	16 40 51.94
144	14 21 31.064	16 45 49.85	200	16 20 9.964	15 53 23.81
145	14 23 11.387	16 50 40.76	201	16 23 0.959	16 17 57.48
146	14 28 12.905	13 43 16.55	202	16 23 43.537	21 9 29.66
147	14 33 46.108	13 52 14.60	203	16 30 18.736	18 32 9.72
148	14 33 55.070	14 8 48.84	204	16 34 32.419	21 29 43.20
149	14 34 22.174	14 20 23.45	205	16 34 36.256	21 4 1.58
150	14 34 54.307	12 16 29.77	206	16 37 12.274	18 52 12.21
151	14 39 4.926	13 42 18.62	207	16 40 7.990	21 41 3.72
152	14 42 33.357	10 38 27.29	208	16 41 6.008	24 23 11.15
153	14 42 47.985	10 47 39.30	209	16 41 7.071	21 35 54.42
154	14 44 10.403	10 18 35.81	210	16 41 50.606	24 15 51.12
155	14 44 35.229	10 35 48.49	211	16 52 37.309	26 25 39.09
156	14 51 54.337	7 10 15.57	212	16 53 3.366	27 43 31.09
157	14 57 3.620	6 3 17.78	213	16 53 10.777	13 20 26.52
158	14 58 1.431	7 15 39.93	214	16 55 4.596	28 2 57.96
159	14 58 12.582	6 51 17.26	215	16 55 31.065	28 22 0.37
160	14 59 35.593	6 19 28.56	216	16 57 44.663	28 3 54.25
161	14 59 57.698	6 54 50.52	217	16 58 39.016	27 55 53.96
162	15 0 33.375	6 49 9.03	218	16 59 24.776	27 54 39.07
163	15 4 21.645	3 22 6.91	219	17 5 10.403	29 52 34.77
164	15 5 11.046	7 10 34.03	220	17 5 37.478	29 41 14.99
165	15 8 54.017	6 59 39.72	221	17 6 47.473	30 2 30.62
166	15 12 35.554	+ 3 51 2.73	222	17 8 16.677	30 0 8.39
167	15 17 4.230	- 0 2 17.19	223	17 9 20.175	29 42 53.91
168	15 20 28.516	- 0 6 57.69	224	17 10 7.169	-31 12 16.83

Number.	α 1858.0.	δ 1858.0.	Number.	α 1858.0.	δ 1858.0.
	^h ^m ^s	[°] ['] ["]		^h ^m ^s	[°] ['] ["]
225	17 12 14.840	—31 25 56.61	281	19 19 18.450	—51 16 7.09
226	17 13 4.999	31 26 22.48	282	19 23 22.183	50 51 50.34
227	17 17 17.581	32 50 3.02	283	19 23 34.615	51 34 45.35
228	17 19 44.388	32 52 53.83	284	19 26 53.202	51 45 7.15
229	17 23 0.424	34 10 1.01	285	19 29 44.020	51 51 59.82
230	17 23 54.929	34 16 20.54	286	19 30 15.827	51 50 49.35
231	17 29 16.449	35 21 48.14	287	19 30 35.565	52 5 43.17
232	17 31 4.961	35 33 46.60	288	19 33 0.830	52 8 8.42
233	17 33 12.654	36 52 6.28	289	19 33 15.841	52 16 22.64
234	17 34 26.669	36 42 1.87	290	19 34 26.520	52 21 40.38
235	17 40 15.178	37 28 49.04	291	19 38 11.319	52 25 21.16
236	17 41 32.567	37 45 43.95	292	19 39 33.763	52 35 4.72
237	17 44 36.555	38 35 8.95	293	19 40 57.485	52 47 37.75
238	17 45 57.092	38 38 45.01	294	19 42 1.927	52 40 19.22
239	17 50 27.549	39 13 45.64	295	19 45 4.527	53 10 20.41
240	17 50 39.138	39 39 2.66	296	19 45 36.756	53 4 53.37
241	17 54 38.324	40 38 8.40	297	19 50 33.215	53 21 50.75
242	17 55 11.130	40 26 50.86	298	19 50 43.777	53 12 39.53
243	18 2 23.867	41 44 28.49	299	19 56 47.461	53 30 37.25
244	18 5 14.187	41 56 26.36	300	19 57 18.613	52 58 52.81
245	18 5 36.073	43 12 19.51	301	20 0 15.512	53 45 3.25
246	18 7 1.414	42 30 48.85	302	20 2 33.653	54 1 31.30
247	18 7 5.615	42 15 28.83	303	20 5 17.695	54 11 0.36
248	18 8 31.282	42 20 5.76	304	20 6 48.770	54 14 53.47
249	18 10 43.566	43 49 49.10	305	20 9 15.916	54 29 49.18
250	18 10 52.913	43 1 59.55	306	20 11 41.803	54 42 28.61
251	18 11 7.779	42 37 40.29	307	20 15 45.780	54 16 41.37
252	18 12 9.145	42 59 37.64	308	20 16 25.769	54 39 2.12
253	18 12 36.869	42 39	309	20 17 13.505	54 45 46.37
254	18 13 58.237	44 10 30.94	310	20 18 46.916	55 33 8.81
255	18 18 12.611	44 14 43.36	311	20 19 7.030	55 2 3.04
256	18 18 54.896	43 55 46.90	312	20 21 57.156	54 59 26.98
257	18 21 39.243	44 41 8.96	313	20 22 58.968	54 56 2.85
258	18 27 50.763	45 34 44.15			
259	18 33 11.685	46 18 24.55		α 1859.0.	δ 1859.0.
260	18 35 45.167	46 43 42.28	314	20 25 26.390	55 3 20.79
261	18 36 12.466	46 31 17.59	315	20 27 7.650	55 18 29.95
262	18 41 53.432	46 45 22.59	316	20 27 13.290	55 24 33.43
263	18 43 23.840	47 26 22.74	317	20 31 23.834	55 36 23.14
264	18 44 10.419	47 49 47.56	318	20 33 40.930	55 36 2.15
265	18 44 28.573	47 47 17.12	319	20 34 34.990	55 41 47.50
266	18 46 26.978	47 45 18.57	320	20 38 21.560	55 43 23.42
267	18 46 31.226	47 34 3.31	321	20 39 58.730	55 53 23.14
268	18 48 13.570	48 9 23.70	322	20 43 12.100	56 6 49.19
269	18 49 54.520	48 28 21.45	323	20 44 29.930	55 59 27.04
270	18 52 54.066	48 54 32.28	324	20 45 35.640	55 45 12.47
271	18 53 55.641	48 36 18.11	325	20 47 1.230	56 14 47.53
272	18 54 10.142	48 51 11.31	326	20 47 55.460	56 20 9.53
273	18 56 41.428	49 14 21.17	327	21 1 2.480	57 5 12.43
274	18 59 22.395	49 32 0.29	328	21 2 14.520	57 5 6.31
275	19 3 52.330	49 46 24.01	329	21 4 50.880	57 8 13.18
276	19 5 52.858	50 13 41.25	330	21 8 3.260	57 18 3.90
277	19 6 44.688	49 42 18.51	331	21 10 45.750	57 12 15.77
278	19 12 11.637	50 30 20.14	332	21 11 6.720	57 26 34.46
279	19 14 33.567	50 46 57.51	333	21 12 39.970	—57 23 55.34
280	19 19 10.963	—51 3 5.09			

Number.	α 1859.0.	δ 1859.0.	Number.	α 1859.0.	δ 1859.0.
	^h ^m ^s	[°] ['] ^{''}		^h ^m ^s	[°] ['] ^{''}
334	21 14 20.600	—57 51 22.09	349	21 35 8.380	—58 41 34.64
335	21 18 19.350	57 45 21.06	350	21 37 51.400	58 40
336	21 20 26.300	57 29 5.95	351	21 40 18.106	58 57 17.50
337	21 20 48.940	57 46 28.59	352	22 8 41.970	60 32 20.95
338	21 21 55.210	57 55 14.83	353	22 8 48.310	60 57 36.81
339	21 23 0.430	58 0 17.76	354	22 9 36.790	60 49 14.47
340	21 23 22.890	57 42 4.33	355	22 11 13	61 8 11.00
341	21 25 2.280	58 0 4.65	356	22 12 6.080	60 39 16.90
342	21 28 35.340	58 20 30.78	357	22 16 36.870	61 5 50.15
343	21 29 54.810	58 4 24.05	358	22 18 40.420	61 17 31.70
344	21 30 52.172	58 22 23.85	359	22 21 12.300	61 13 40.79
345	21 32 9.160	58 15 1.52	360	22 23 53.980	61 32 27.09
346	21 33 18.394	58 32 14.83	361	22 25 40.970	61 40 32.46
347	21 33 39.750	58 0 28.20	362	22 27 25.610	61 43 53.15
348	21 33 57.470	—57 55 21.35	363	22 30 54.250	—61 57 58.99

The following are the authorities for the observations and the places of the comparison stars :—

ALTONA. Astr. Nachr., L. 187.

ANN ARBOR. Astr. Nachr., XLIX. 179. Brunnow's Astr. Notices, I. 6, 53.

ARMAGH. Monthly Notices, XIX. 305.

BATAVIA. Astr. Nachr., L. 107.

BERLIN. Astr. Nachr., XLVIII. 333, LI. 65.

BONN. Astr. Nachr., XLIX. 253, LI. 187.

BRESLAU. Astr. Nachr., L. 37.

CAMBRIDGE, ENG. Astr. Nachr., L. 243.

CAMBRIDGE, U. S. Astr. Nachr., LI. 273. Brunnow's Astr. Notices, I. 71.

CAPE OF GOOD HOPE. Mem. Astr. Soc., XXIX. 59–83. The observations were made with two different instruments ; those made with the larger have been denoted in the list of observations which follows by "Cape 1," and those made with the smaller by "Cape 2."

CHRISTIANIA. Astr. Nachr., LII. 277.

COPENHAGEN. Oversigt kgl. danske Videnskabernes Selkabs, 1858.

DORPAT. Beob. Kaiserl. Sternw. Dorpat, Vol. XV. These observations are published in a crude form, and I was unable to reduce and use them, from a want of the instrumental constants.

DURHAM. Astr. Nachr., L. 11.

FLORENCE. Astr. Nachr., XLVIII. 347, 355, XLIX. 57, L. 97. The observation of October 13 is erroneous as regards the comparison star, which it seems should be Piazzì XV. 227.

GENEVA. Astr. Nachr., XLIX. 115, L. 21.

GÖTTINGEN. Astr. Nachr., XLIX. 235, L. 11.

GREENWICH. Greenwich Observations for 1858. Monthly Notices, XIX. 12.

KÖNIGSBERG. Astr. Nachr., L. 71, LIII. 289.

KREMSMÜNSTER. Astr. Nachr., XLIX. 68, 79, 257, LI. 23.

LEYDEN. Astr. Nachr., L. 157. The observer is mistaken in the comparison star of his last observation ; it should be Weisse XV. 369.

LIVERPOOL. Astr. Nachr., XLIX. 267. Monthly Notices, XIX. 54.

MARKREE. Observations on Donati's Comet, 1858, at Markree.

PADUA. Astr. Nachr., XLVIII. 357.

PARIS. Annales de l'Observatoire Imperial, Paris. Tome XIV. Observations.

PULKOVA. Astr. Nachr., L. 307. Beobachtungen der Grossen Cometen 1858. Otto Struve.

SANTIAGO. Astr. Nachr., LIII. 131. Astr. Jour., VI. 100.

VIENNA. Astr. Nachr., XLVIII. 349, XLIX. 43, 53, L. 227, LII. 57.

WILLIAMSTOWN. Astr. Nachr., L. 7. As the latitude and longitude of the place are uncertain, I have not reduced these observations.

WASHINGTON. Astr. Nachr., XLIX. 55, 113, 363. Astr. Jour., V. 150, 153, 166, 180. The comparison star of October 1 is mistaken.

The typographical errors to be met with are so numerous I cannot undertake to mention them. To render the reduction of the comparison stars from mean to apparent place uniform, the elements of reduction in the British Nautical Almanac for 1858 were adopted as the standard; and the same will be used in reducing our normals from apparent to mean places. Consequently it becomes necessary to add to the observations in which the elements of the Berlin Jahrbuch were used, quantities easily obtained from this small ephemeris.

	R. A.	Dec.		R. A.	Dec.
June 15	+0.09	+0.18	Sept. 18	+0.08	+0.03
July 15	+0.02	+0.22	Oct. 3	+0.07	—0.04
Aug. 14	+0.03	+0.18	Oct. 18	+0.04	—0.19
Sept. 3	+0.05	+0.10	Nov. 2	+0.14	—0.23

For the reduction of the observations for parallax, and the computation of the perturbations, and for comparison, an ephemeris was computed from these elements published by Searle in the Astronomical Journal, V. 188, Searle's own ephemeris not being sufficiently exact for the purpose of comparison.

$T = \text{Sept. } 29.75230$ 1858 Washington Mean Time.

$$\left. \begin{aligned} \pi - \Omega &= 129^\circ 6' 24.8'' \\ \Omega &= 165 18 46.2 \\ i &= 116 57 46.1 \\ \varphi &= 85 21 21.2 \\ \log q &= 9.7622362. \end{aligned} \right\} \text{Mean Equinox and Ecliptic 1858.0.}$$

In the following list the observations of the comet are given reduced for parallax, and are made to accord with the places of the comparison stars given in the foregoing catalogue. Gould's list of Longitudes (in the American Ephemeris) has been used in getting the Paris M. T. of Observation. The comparisons in the two last columns are Obs. — Cal. The declinations of the Southern observations have generally been reduced to the time of observing the right ascension; that observation of right ascension being selected which was nearest in time and which had the same comparison star.

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
June 7.41071	Florence	141° 14' 47.79	+24° 21' 54.73	3	+21.69	+ 6.26
8.37659	"	141 15 36.99	24 27 52.30	10	+39.17	-15.66
9.42802	"	141 16 20.54	24 34 48.42	10	+27.71	- 7.33
10.39044	"	141 17 25.48	24 41 10.00	10	+23.44	+ 5.67
11.40973	"	141 19 3.43	24 47 35.12	1	+28.89	+ 5.05
12.37591	Padua	141 20 31.82	24 53 36.67	4	+11.55	+ 5.14
12.41803	Florence	141 20 21.71	24 53 56.68	1	- 3.35	+10.15
13.37729	Padua	141 22 34.98	24 59 27.99	4	+ 6.81	-14.10
13.40557	Florence	141 22 16.33	25 0 14.83	1	-15.72	+22.34
13.43268	Berlin	141 22 43.08	24 59 50.15	2	+ 7.30	-12.31
14.41069	"	141 24 58.54	25 5 52.65	2	- 0.89	- 7.69
14.41609	Vienna	141 25 15.40	25 5 55.69	2-5	+15.13	- 6.61
15.39007	Florence	141 28 20.08	25 11 23.30	5	+37.49	-31.86
15.40675	Vienna	141 27 58.18		2-5	+14.65	
15.44201	Berlin	141 27 36.29	25 12 2.13	5	- 9.96	- 4.80
16.39944	Kremsmünster	141 30 54.96	25 17 48.71	5	+10.41	- 8.58
16.41628	Berlin	141 30 39.41	25 17 49.11	5	- 8.36	-14.19
17.39261	Florence	141 34 31.47	25 23 26.85	5	+28.40	-23.47
19.37441	"	141 41 42.14	25 35 32.96	5	+12.05	+ 7.07
19.38451	Padua	141 42 8.91	25 35 39.64	5	+23.63	+10.24
28.38292	Florence	142 29 25.62	26 26 8.67	8	+26.28	- 6.86
28.61976	Cambridge, U. S.	142 30 24.43	26 27 36.77	6	- 7.25	+ 2.80
29.38224	Florence	142 35 56.97	26 31 43.74	8	+22.16	- 2.41
29.41947	Berlin	142 36 2.15	26 31 52.88	6	+13.31	- 5.57
30.37599	Florence	142 42 46.34	26 37 8.61	8	+22.98	- 5.44
30.38577	Vienna	142 42 24.72	26 37 20.26	8	- 2.72	+ 2.98
July 2.37816	Florence	142 56 57.17	26 48 14.56	7	+ 4.77	+ 1.86
8.38159	"	143 46 55.06	27 20 55.54	11	+34.65	- 9.74
9.38324	Vienna	143 55 34.04	27 26 44.86	12	+ 6.24	+ 6.85
9.60789	Washington	143 57 42.00	27 27 56.51	11	+ 9.40	+ 6.19
10.37333	Florence	144 5 0.20	27 32 2.33	11	+16.80	- 1.59
10.59343	Washington	144 6 50.62	27 33 16.24	9	+ 1.75	- 0.72
10.59343	"	144 6 59.45	27 33 18.41	11	+10.58	+ 1.45
11.59576	"	144 16 28.58	27 38 51.84	9	- 0.61	+ 1.42
12.37144	Florence	144 24 2.74	27 43 13.41	9	- 5.59	+ 3.93
13.37158	"	144 34 23.43	27 48 47.14	12	+10.19	+ 2.20
13.59089	Cambridge, U. S.	144 36 26.15	27 50 6.11	12	- 1.67	+ 7.56
14.36879	Florence	144 44 34.08	27 54 18.74	12	+ 3.24	- 2.50
14.58534	Washington	144 46 51.57	27 55 38.77	9	+ 4.72	+ 4.34
15.58781	Cambridge, U. S.	144 57 23.93	28 1 20.09	15	- 1.44	+ 4.97
15.58781	"	144 57 25.18	28 1 17.14	16	- 0.19	+ 2.02
15.58803	Washington	144 57 30.05	28 1 17.20	12	+ 4.55	+ 2.00
16.58028	"	145 8 17.33	28 6 59.62	12	+ 5.49	+ 5.02
17.58135	"	145 19 23.15	28 12 55.11	14	+ 4.72	+15.60
19.36496	Florence,	145 40 9.14	28 22 35.10	14	+26.92	-25.84
19.57128	Cambridge, U. S.	145 42 5.95	28 24 25.03	13	- 0.82	+11.59
19.57128	"	145 42 8.63	28 24 14.88	14	+ 1.86	+ 1.44
20.35855	Florence,	145 51 27.80	28 28 46.13	13	+ 4.39	- 5.81
21.58017	Washington	146 6 8.33	28 36 7.34	14	+ 1.28	+ 0.80
23.61560	Ann Arbor	146 31 25.02	28 48 22.98	17	- 2.55	- 0.64
24.58362	Washington	146 43 53.23	28 54 25.65	17	+ 0.71	+ 5.84
25.57816	"	146 56 54.02	29 0 37.18	17	+ 0.72	+ 7.35
27.57886	"	147 23 48.85	29 13 12.53	18	- 1.71	+ 5.10
28.57465	"	147 37 32.23	29 19 43.76	19	- 7.18	+12.22
29.57953	"	147 51 52.66	+29 25 49.46	21	+ 0.36	-14.60

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
July 31.35674	Florence	148° 17' 13.40	+29° 37' 38.77	21	-28.85	-12.75
Aug. 4.35187	"	149 19 6.35	30 5 14.06	27	-3.54	-14.07
4.37075	Berlin	149 19 22.65	30 5 46.12	23	-5.38	+9.91
4.57000	Washington	149 22 39.36	30 7 9.00	23	-0.37	+7.56
5.34162	Kremsmünster	149 35 2.22	30 12 41.42	23	-8.19	+7.34
5.34827	Florence	149 35 27.94	30 13 3.26	23	+12.02	+26.29
5.54365	Cambridge, U. S.	149 38 31.44	30 14 9.93	20	+3.83	+8.10
5.54365	"	149 38 21.08	30 14 8.53	23	-6.53	+6.70
6.34048	Florence	149 51 27.72	30 19 54.03	23	-9.48	+4.37
7.36200	Berlin	150 8 43.81	30 27 30.63	22	-4.35	+6.21
7.56564	Washington	150 12 8.39	30 28 59.20	23	-7.85	+3.44
8.56004	"	150 29 24.36	30 36 40.41	24	-0.50	+9.71
10.33796	Kremsmünster	151 1 3.61	30 50 22.10	24	+6.28	+11.63
10.35184	Berlin	151 1 5.40	30 50 24.07	24	-6.98	+7.07
10.56020	Washington	151 4 50.17	30 52 5.23	24	-9.79	+12.49
11.33986	Kremsmünster	151 19 15.59	30 58 12.55	24	+0.36	+6.60
12.33952	"	151 37 33.32	31 6 17.22	36	-20.96	+8.66
12.59010	Ann Arbor	151 42 30.69	31 8 5.47	34	-7.89	-5.36
13.58572	"	152 1 33.00	31 16 24.08	30-2	-10.57	+2.20
14.33189	Vienna	152 16 14.43	31 22 42.03	32	-4.01	+6.51
14.34131	Kremsmünster	152 16 19.63	31 22 45.35	32	-9.94	+5.09
14.37376	Copenhagen	152 17 0.51	31 23 22.17	32	-7.45	+25.54
14.571921	Ann Arbor	152 21 1.85	31 24 37.64	32	-1.10	+0.91
15.556670	Washington	152 40 53.49	31 32 59.51	35	+6.95	+0.20
15.578418	Ann Arbor	152 41 13.22	31 33 18.56	35	+0.24	+8.05
16.329858	Florence	152 56 21.66	31 39 25.74	35	-13.09	-14.24
16.367755	Copenhagen	152 57 18.67	31 40 24.83	32	-3.02	+25.08
16.550079	Washington	153 1 12.45	31 41 39.36	35	+4.49	+4.30
17.327305	Vienna	153 17 15.93	31 48 22.98	25-6	-7.69	-1.78
17.335186	Kremsmünster	153 17 29.01	31 48 33.89	28	-4.56	+4.95
17.360620	Copenhagen	153 18 35.17	31 48 40.92	37	+29.33	-1.52
17.375546	"	153 19 4.92	31 48 50.15		+40.15	-0.23
17.541171	Washington	153 22 1.02	31 50 19.63	35	+5.74	+1.18
17.568303	Ann Arbor	153 22 29.67	31 50 35.82	37	-0.15	+2.92
18.320072	Vienna	153 38 49.51	31 57 23.25	35	+12.98	+7.12
19.346349	Berlin	154 1 6.13	32 6 48.19	31	+0.94	+13.47
19.376823	Cambridge, Eng.	154 1 46.76	32 6 38.02	46	+0.80	-13.45
19.544957	Washington	154 5 37.10	32 8 36.44	26	+6.69	+12.53
19.548659	Cambridge, U. S.	154 5 27.88	32 8 29.71	53	-7.49	+3.71
20.544643	"	154 28 57.08	32 17 51.52	33	-8.00	+12.26
20.546599	"	154 28 54.87	32 17 43.99	40	-12.90	+3.64
21.330193	Kremsmünster	154 46 5.90	32 25 20.05	41	-8.55	+18.06
22.539509	Washington	155 14 45.23	32 36 45.15	41	-11.54	+10.71
22.577310	Ann Arbor	155 15 44.05	32 37 3.12	41	-7.46	+6.82
23.341254	Königsberg	155 34 14.71	32 44 9.54	38	-15.77	-11.18
23.360472	Copenhagen	155 34 37.11	32 44 21.26	38	-21.84	-10.66
23.370056	Cambridge, Eng.	155 35 12.50	32 44 42.35	38	-0.64	+4.82
23.379349	"	155 35 21.95	32 44 52.87	44	-4.97	+9.89
23.545062	Washington	155 39 21.99	32 46 28.14	44	-11.08	+8.04
23.563000	Ann Arbor	155 39 52.38	32 46 40.21	44	-7.40	+9.59
24.328091	Königsberg	155 59 7.10	32 54 9.92	38	-5.00	+7.73
24.333372	Copenhagen	155 59 21.07	32 54 19.14	38	+0.92	+13.82
24.335916	"	155 59 27.58	32 54 7.43		+3.55	+0.60
24.538632	Washington	156 4 26.18	32 56 20.54	38	-7.54	+13.21
25.304874	Vienna	156 24 20.98	+33 4 0.52	38	-0.15	+14.69

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Aug. 25.320927	Vienna	156° 24' 28.28	+33° 3' 58.26	38	-18.03	+ 2.75
25.381750	Cambridge, Eng.	156 26 0.38	33 4 36.78	38	-21.40	+ 4.70
25.536968	Washington	156 30 19.48	33 6 21.39	38	- 6.71	+15.75
26.374066	Christiania	156 52 43.15	33 14 47.88	44	- 1.30	+14.43
26.378525	"	156 52 32.18	33 14 43.05	39	-19.49	+ 6.88
26.395693	"	156 53 13.79	33 14 54.46	38	- 5.70	+ 7.79
26.482289	"	156 55 36.26	33 15 48.95	38	- 3.68	+ 9.47
27.370067	Cambridge, Eng.	157 19 59.28	33 24 58.51	43	- 3.51	+14.01
27.380735	Christiania	157 20 16.24	33 25 3.85	43	- 4.31	+12.76
28.309822	Vienna	157 46 20.57	33 34 32.47	38	-16.50	+ 5.07
28.318270	Berlin	157 46 39.71	33 34 46.46	42	-11.92	+13.79
28.319291	Geneva	157 46 50.62	33 34 45.89	49	- 2.77	+12.59
28.322451	"	157 47 4.49	33 34 49.00	50	+ 5.65	+13.73
28.480204	Christiania	157 51 24.47	33 36 33.58	38	- 6.96	+19.89
30.299305	Kremsmünster	158 45 36.15	33 55 39.06	48	- 6.40	+20.21
30.304230	Vienna	158 45 47.70	33 55 36.62	51-2	- 3.95	+14.75
30.309523	Florence	158 45 37.69	33 55 25.96	54	-23.73	+ 0.73
30.377443	Cambridge, Eng.	158 48 3.62	33 56 17.78	45	- 3.26	+ 9.48
30.526796	Cambridge, U. S.	158 52 31.74	33 57 54.46	48	-12.05	+11.38
31.291317	Vienna	159 16 32.49		51-2	-12.39	
31.319005	Kremsmünster	159 17 33.52	34 6 20.04	48	- 4.31	+12.83
31.337849	Copenhagen	159 17 59.57	34 6 25.76	48	-14.33	+ 6.54
31.339817	"	159 18 2.98	34 6 36.56		-14.69	+16.08
31.551986	Ann Arbor	159 24 53.06	34 8 48.07	57	-12.42	+12.21
Sept. 1.295680	Florence	159 49 5.83	34 16 36.92	57	-14.72	+ 5.70
1.309567	Kremsmünster	159 49 37.11	34 16 54.23	51	-11.00	+14.08
1.320362	Bonn	159 50 1.29	34 17 0.04	51	- 8.25	+13.02
1.322480	Christiania	159 50 3.13	34 17 0.94	51	-10.62	+12.57
1.326603	Berlin	159 50 11.89	34 17 6.08	51	- 9.75	+15.17
1.540701	Ann Arbor	159 57 17.76	34 19 16.27	57	-10.16	+ 8.18
1.563647	"	159 58 12.94	34 19 38.10	51	- 1.96	+15.32
2.298887	Kremsmünster	160 23 1.61	34 27 23.80	51	- 7.84	+ 9.99
2.301560	Florence	160 22 49.02	34 27 29.68	57	-25.94	+14.16
2.305161	Vienna	160 23 9.90	34 27 32.33	56	-12.48	+14.50
2.327381	Geneva	160 24 1.89	34 27 48.29	57	- 6.35	+16.22
2.337187	Copenhagen	160 24 19.82	34 27 50.99	51	- 8.67	+12.64
2.350639	Königsberg	160 24 51.38	34 27 46.76	55	- 4.90	- 0.21
2.406874	Christiania	160 26 42.59	34 28 19.63	51	-10.03	- 3.37
2.418651	Pulkova	160 27 12.15	34 28 48.55		- 4.86	+18.00
2.427687	Christiania	160 27 32.91	34 28 48.24	57	- 2.83	+11.90
3.281247	Vienna	160 57 29.49	34 37 56.89	55	- 5.72	+14.13
3.292555	Florence	160 58 0.01	34 38 2.05	56	+ 0.58	+12.07
3.295584	Vienna	160 57 46.70	34 37 59.35	55	-19.27	+ 7.42
3.322590	Geneva	160 58 56.61	34 38 20.04	56	- 7.34	+10.85
3.530240	Washington	161 6 26.13	34 40 36.24	55	- 5.76	+14.37
4.276201	Kremsmünster	161 33 42.46	34 48 33.42	56	-10.63	+16.17
4.289568	"	161 34 16.06	34 48 39.87	56	- 6.91	+14.13
4.300379	Florence	161 34 36.28	34 48 49.44	56	-10.86	+16.83
4.308592	Christiania	161 34 57.50	34 48 48.59	56	- 8.02	+10.76
4.308932	Geneva	161 35 4.38	34 48 56.46	56	- 1.90	+18.41
4.311267	Berlin	161 35 0.39	34 48 51.87	56	-11.11	+12.34
4.316907	Geneva		34 48 52.29	55		+10.87
4.321872	"	161 35 25.19		55	-10.05	
4.421240	Christiania	161 39 10.86	34 49 59.11	56	- 7.32	+ 9.72
5.293191	Florence	162 12 25.51	+34 59 17.57	55	- 9.81	+17.00

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Sept. 5.383408	Armagh	162° 15' 54.08	+35° 0' 15.53	55	—12.20	+18.25
5.419101	Christiania	162 17 20.59	35 0 30.13	56	— 9.39	+10.39
5.419101	"	162 17 23.46	35 0 35.01	55	— 6.52	+15.27
5.529968	Washington	162 21 43.11	35 1 40.76	56	— 7.61	+11.49
5.537181	Ann Arbor	162 21 58.91	35 1 48.01	55	— 8.84	+14.21
5.654786	Durham	162 26 34.00	35 3 1.50	55	—11.85	+14.05
6.329700	Copenhagen	162 53 33.17	35 10 10.64		—17.06	+23.08
6.350846	"	162 54 8.16	35 10 6.70	58	—33.77	+ 6.06
6.364638	Armagh	162 55 13.80	35 10 26.90	55	— 1.88	+17.74
6.524524	Washington	163 1 26.35	35 12 8.28	56	—21.99	+20.40
6.544780	Ann Arbor	163 2 31.25	35 12 14.35	58	— 7.04	+13.99
6.917566	"	163 18 0.35	35 16 2.85	58	— 5.65	+13.70
7.315249	Berlin	163 34 46.30	35 20 3.87	58	— 6.76	+12.91
7.367969	Cambridge, Eng.	163 37 1.79	35 20 42.31	59	— 6.24	+19.48
7.514951	Washington	163 43 31.43	35 21 52.33	61	+ 5.57	+ 0.87
8.322259	Copenhagen	164 18 58.21	35 30 3.29		+ 9.08	+12.00
8.340315	Königsberg	164 19 28.57	35 30 10.23	60	— 8.99	+ 8.36
8.516888	Cambridge, U. S.	164 27 29.44	35 31 53.17	60	— 3.92	+ 8.14
8.516888	"	164 27 21.05	35 31 46.46	61	—12.31	+ 1.43
8.516888	"	164 27 25.09	35 31 57.43	66	— 8.27	+12.40
9.299974	Geneva	165 3 26.88	35 39 26.56	66	— 6.95	+12.82
9.302115	Florence	165 3 40.97	35 39 16.42	63	+ 1.10	+ 1.48
9.312209	Bonn	165 3 57.18	35 39 30.23	60	—11.08	+ 9.61
9.315659	Königsberg	165 4 9.73	35 39 38.55	60	— 8.24	+15.98
9.315932	Berlin	165 4 7.88	35 39 21.79	60	—10.86	— 0.93
9.319178	Paris	165 4 14.60	35 39 37.57	66	—13.28	+13.02
9.523602	Washington	165 13 57.13	35 41 33.91	61	— 9.16	+14.92
10.263712	Kremsmünster	165 49 36.73	35 48 19.58	65	—14.43	+16.55
10.277018	Vienna	165 50 23.97	35 48 24.58	65-6	— 6.50	+14.44
10.284499	Florence	165 50 43.39	35 48 29.91	65	— 9.20	+15.78
10.294314	Kremsmünster	165 51 7.95	35 48 35.62	65	—13.65	+16.26
10.306418	Berlin	165 51 50.46	35 48 42.52	65	— 6.96	+16.70
10.307120	Copenhagen	165 52 3.80	35 48 36.08		+ 4.30	+ 9.89
10.325063	Königsberg	165 52 42.14	35 48 50.29	65	—10.49	+14.54
10.325709	Paris	165 52 32.51	35 48 45.94	65	—22.03	+ 9.85
10.354888	Armagh	165 54 12.98	35 49 1.87	65	— 8.07	+10.27
10.520362	Washington	166 2 38.05	35 50 44.35	65	+ 4.00	+25.32
10.628708	Bonn	166 7 46.05	35 51 32.36	65	—13.14	+16.62
11.280961	Kremsmünster	166 41 6.09	35 57 2.34	64	— 9.66	+14.46
11.301907	Geneva	166 42 6.50	35 57 16.88	65	—14.52	+17.61
11.319423	Paris	166 43 10.02	35 57 29.26	69	— 5.64	+22.33
11.321783	Copenhagen	166 43 13.97	35 57 16.04	65	— 9.05	+ 7.94
11.325972	Königsberg	166 43 29.17	35 57 29.14	65	— 6.92	+18.96
11.411657	Pulkova	166 47 59.70	35 58 6.22		— 4.47	+13.85
12.261121	Kremsmünster	167 33 18.94	36 4 47.28	69	—10.38	+14.42
12.286131	Christiania	167 34 43.59	36 5 1.27	68	— 7.88	+17.13
12.286559	Florence	167 34 44.73	36 4 53.86	67	— 8.15	+ 9.55
12.293542	Königsberg	167 34 53.84	36 5 9.51	69	— 7.21	+22.06
12.295472	Geneva	167 35 12.02	36 4 58.98	69	—10.15	+10.66
12.306918	"	167 35 50.51	36 5 3.35	71	— 9.32	+ 9.89
12.311009	Liverpool	167 35 58.70	36 5 11.76	62	—14.60	+16.46
12.321429	"	167 36 36.73	36 5 14.60	62	—10.88	+14.63
12.331857	"	167 37 12.38	36 5 20.44	62	— 9.58	+15.80
12.346679	Paris	167 38 6.03	36 5 28.54	69	— 4.79	+17.28
12.354098	Armagh	167 38 15.70	+36 5 30.97	69	—19.59	+16.39

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Sept. 12.411405	Pulkova	167° 41' 25.95	+36° 5' 53.48		-18.72	+13.41
12.519159	Washington	167 47 33.62	36 6 47.30	69	-11.68	+19.75
12.526442	Ann Arbor	167 47 58.52	36 6 45.74	69	- 8.03	+15.00
12.536618	"	167 48 33.25	36 6 48.84	67	- 7.21	+13.66
12.612848	Bonn	167 52 41.84	36 7 22.26	69	-13.13	+13.93
13.277211	Kremsmünster	168 30 27.71	36 11 58.86	69	-12.00	+15.48
13.277425	Vienna	168 30 32.55	36 11 56.74	69	- 7.90	+13.28
13.291278	Königsberg	168 31 19.32	36 12 1.52	71	- 9.26	+12.59
13.291733	Christiania	168 31 15.14	36 12 2.23	62	-15.02	+13.12
13.294974	Geneva	168 31 27.37	36 12 6.30	69	-14.06	+15.92
13.305238	Berlin	168 31 59.11	36 12 8.35	69	-18.00	+13.93
13.317599	Paris	168 32 50.64	36 12 18.72	69	- 9.48	+19.45
13.328567	Leyden	168 33 27.24	36 12 15.34	70	-11.07	+11.78
13.329885	Copenhagen	168 33 27.66	36 12 12.04		-15.24	+ 7.96
13.333017	Christiania	168 33 44.19	36 12 20.78	68	- 9.62	+15.47
13.335091	Cambridge, Eng.	168 33 50.03	36 12 22.04	71	-11.05	+15.93
13.371491	Leyden	168 35 52.93	36 12 37.07	69	-15.03	+16.77
13.516267	Washington	168 44 23.18	36 13 30.19	69	-12.22	+14.31
13.525041	Ann Arbor	168 44 54.92	36 13 33.94	69	-11.36	+14.72
14.273293	Kremsmünster	169 29 51.01	36 17 57.33	69	- 6.96	+13.63
14.288013	Königsberg	169 30 44.22	36 18 2.07	72	- 7.87	+13.57
14.295328	Vienna	169 31 1.74	36 18 3.61	67-9	-17.26	+12.73
14.307231	Geneva	169 31 50.02	36 18 7.03	69	- 9.23	+12.28
14.307231	"	169 31 48.81	36 18 5.89	70	-10.44	+11.14
14.316540	Leyden	169 32 34.48		74	- 2.62	
14.318520	Copenhagen	169 32 27.58	36 18 13.68		-16.83	+15.27
14.323235	Paris	169 32 52.48	36 18 17.61	69	- 9.41	+17.69
15.294684	Vienna	170 34 17.06	36 22 47.86	72	- 8.36	+11.71
15.299126	Königsberg	170 34 31.52	36 22 58.52	74	-11.24	+21.30
15.299256	Geneva	170 34 26.31	36 22 49.14	69	-16.96	+10.88
15.299256	"	170 34 26.10	36 22 49.20	70	-17.17	+10.94
15.308400	"	170 35 3.64	36 22 43.84	73	-15.32	+ 4.37
15.316643	Liverpool	170 35 38.37	36 22 56.37	81	-13.78	+14.90
15.324451	Berlin	170 36 3.78	36 22 59.39	75	-17.88	+16.04
15.332976	Cambridge, Eng.	170 36 43.46	36 22 59.71	74	-11.53	+14.31
15.337503	Leyden	170 36 58.28	36 22 56.14	73	-14.41	+ 9.66
15.330548	Liverpool	170 36 37.19	36 23 0.77	81	- 8.31	+15.96
15.340177	Cambridge, Eng.	170 37 7.72	36 22 59.88	75	-15.43	+12.76
15.344453	Liverpool	170 37 35.46	36 23 5.47	81	- 4.41	+17.33
16.282016	Kremsmünster	171 40 22.08	36 26 5.74	80	-10.77	+15.72
16.289858	Florence	171 40 42.92	36 26 10.11	78	- 3.41	+18.94
16.294017	Christiania	171 41 9.40	36 26 6.29	62	-13.14	+14.51
16.305316	Königsberg	171 41 56.83	36 26 3.94	76	-12.52	+10.53
16.349513	Leyden	171 45 3.20	36 25 58.38	76	- 9.59	+ 1.30
16.354993	Cambridge, Eng.	171 45 28.16	36 26 17.25	76	- 7.41	+16.81
16.366305	Leyden	171 46 4.63	36 26 15.05	77	-17.98	+13.03
16.411922	Pulkova	171 49 22.50	36 26 19.33		-10.14	+11.15
16.527175	Ann Arbor	171 57 20.10	36 26 36.40	78	-14.97	+13.66
16.548921	"	171 58 52.17	36 26 40.60	80	-14.29	+15.28
16.638835	Bonn	172 5 18.22	36 26 47.11	76	- 7.51	+11.66
17.259056	Vienna	172 49 50.32	36 27 36.18	82	- 8.84	+16.79
17.264848	Kremsmünster	172 50 9.59	36 27 36.31	82	-15.02	+16.64
17.282358	Königsberg	172 51 27.98	36 27 39.12	80	-13.64	+18.84
17.291647	Vienna	172 52 6.45	36 27 32.04	76	-16.05	+11.53
17.306382	Copenhagen	172 53 6.85	+36 27 38.35	78-80	-20.55	+17.43

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Sept. 17.329512	Christiania	172° 55' 11".24	+36° 27' 43".33		+ 1".84	+21".81
17.359841	Cambridge, Eng.	172 57 24.53	36 27 35.67	79	+ 1.18	+12.48
17.412500	Pulkova	173 1 3.30	36 27 37.43		-13.25	+14.35
17.532051	Ann Arbor	173 9 55.97	36 27 41.20	80	-13.00	+17.41
17.550766	"	173 11 18.70	36 27 39.60	78	-13.94	+15.88
18.287944	Königsberg	174 7 41.96	36 26 52.95	82	- 5.55	+10.13
18.317231	Copenhagen	174 9 47.28	36 26 36.12	82	-17.56	- 3.46
18.315490	Paris	174 9 50.67	36 27 5.47	82	-15.38	+25.92
18.319006	Copenhagen	174 10 16.79			+ 3.62	
18.319751	Liverpool	174 10 4.71	36 26 54.20	84	-11.95	+14.91
18.328100	"	174 10 44.18	36 26 50.64	84	-11.69	+12.29
18.336446	"	174 11 25.44	36 26 46.37	84	- 9.63	+ 8.98
18.351046	Markree	174 12 34.18	36 26 29.05	82	- 9.53	- 6.62
18.413297	Pulkova	174 17 27.00	36 26 37.87		-10.07	+ 9.83
18.424440	Christiania	174 18 19.92	36 26 48.38		- 9.80	+21.78
18.534230	Ann Arbor	174 26 57.07	36 26 28.80	80	-13.13	+17.32
18.545534	Christiania	174 27 44.11	36 26 24.43	82	-19.88	+14.61
19.272473	Kremsmünster	175 26 52.76	36 23 57.00	82	-13.13	+17.81
19.286802	Christiania	175 28 3.28	36 23 47.34	83-4	-14.10	+12.02
19.289696	Geneva	175 28 16.40	36 23 47.67	86	-15.42	+13.14
19.289697	Florence	175 28 16.03	36 23 46.81	86	-17.29	+12.36
19.312751	Paris	175 30 10.86	36 23 35.74	86	-18.14	+ 7.51
19.387398	Armagh	175 36 59.67	36 23 13.49	82	+18.68	+ 6.36
19.515182	Washington	175 47 20.76	36 22 40.93	82	- 4.56	+12.25
19.531160	Ann Arbor	175 48 29.01	36 22 36.21	86	-17.26	+12.55
20.252856	Florence	176 51 5.56	36 17 55.79	86	- 4.42	+ 9.65
20.265575	Kremsmünster	176 52 6.63	36 17 54.15	85-6	-10.89	+13.83
20.288793	Christiania	176 54 6.19	36 17 44.26	84	-14.68	+14.67
20.310506	Paris	176 55 56.55	36 17 32.58	86	-20.02	+13.09
20.344173	Durham	176 59 4.23		86	-11.91	
20.360918	Markree	177 1 4.66	36 17 10.97	85-6	+19.05	+15.35
20.362970	Durham		36 17 8.06	86		+13.43
20.470112	Christiania	177 10 18.96	36 16 12.75	84-7	-12.33	+10.69
20.510140	Washington	177 14 0.80	36 15 52.79	85	- 6.24	+11.01
20.510962	Cambridge, U. S.	177 13 56.28	36 15 55.65	86	-15.20	+14.28
20.514399	Ann Arbor	177 14 13.81	36 15 53.71	86	-16.22	+14.10
20.515778	Washington	177 14 31.25	36 15 53.84	86	- 6.23	+18.42
20.337975	Göttingen	176 58 20.29	36 17 15.66	86	-17.46	+ 8.64
20.647851	Durham	177 26 20.58		86	-12.96	
20.650006	Berlin	177 26 35.43	36 14 41.65	86	- 9.98	+13.48
20.663728	Durham		36 14 36.18	86		+15.39
20.680067	"	177 29 15.12		86	-14.02	
20.690908	Armagh	177 30 10.59	36 14 16.78	85	-17.72	+10.86
21.299000	Geneva	178 26 46.31	36 8 7.33	86	- 8.18	+18.35
21.299037	Bonn	178 26 39.87	36 8 3.23	88	-14.82	+14.28
21.311531	Königsberg	178 27 56.29	36 7 51.27	88	- 9.39	+11.08
21.303351	Liverpool	178 27 8.29	36 8 1.77	92	-10.92	+15.80
21.317379	Göttingen	178 28 8.88	36 7 55.28	87	-30.04	+19.07
21.325561	Christiania	178 29 7.94	36 7 51.07	87	-17.50	+20.55
21.326150	Göttingen	178 29 1.55		85	-27.25	
21.319350	Liverpool	178 28 41.22	36 7 52.96	92	- 8.91	+18.11
21.326150	Göttingen	178 28 56.49		86	-32.31	
21.328914	Leyden	178 29 34.02	36 7 45.85	89	-10.51	+17.68
21.334417	Copenhagen	178 30 4.85	36 8 1.66	88	- 8.99	+37.35
21.335339	Liverpool	178 30 13.96	+36 7 44.14	92	- 7.24	+20.48

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Sept. 21.335411	Berlin	178° 30' 9.55"	+36° 7' 38.80"	85	-11.95	+15.17
21.337062	Copenhagen	178 30 18.26	36 7 43.82		-12.65	+21.26
21.350418	Armagh	178 31 34.04	36 7 20.35	86	-12.93	+ 7.27
21.351112	Markree	178 31 35.38	36 7 20.64	85-6	-15.54	+ 8.05
21.364569	Cambridge, Eng.	178 33 34.25	36 7 18.18	85	+26.73	+15.09
21.375570	Leyden	178 33 51.15	36 7 10.58	86	-19.23	+15.29
21.471664	Christiania	178 43 5.72	36 5 55.02	86	-14.71	+ 9.06
22.287329	Kremsmünster	180 3 16.71	35 54 35.24	90	-12.99	+15.55
22.290700	Göttingen	180 3 28.68	35 54 35.97	90	-21.42	+19.49
22.294876	Bonn	180 3 56.12	35 54 25.39	90	-19.26	+12.90
22.305836	Göttingen	180 5 8.42	35 54 13.96	89	-13.35	+11.95
22.357669	Markree	180 10 12.18	35 53 14.67	90	-24.22	+ 2.69
23.266456	Kremsmünster	181 45 16.71	35 36 36.83	93	-10.04	+13.25
23.296747	Copenhagen	181 48 34.97	35 35 45.14	93	- 7.21	- 0.33
23.302829	Vienna	181 49 2.03		93	-19.44	
24.270615	"	183 36 39.67	35 12 43.13	94	-11.82	+12.79
24.279692	Liverpool	183 37 45.87	35 12 32.54	92	- 8.00	+16.83
24.290996	Königsberg	183 39 0.60	35 12 10.37	93	-12.01	+12.92
24.290137	Liverpool	183 38 55.72	35 12 14.66	92	- 9.98	+15.83
24.300586	"	183 40 7.05	35 11 57.07	92	-10.56	+15.16
24.332837	Greenwich	183 43 43.65	35 11 6.04		-16.20	+16.63
24.341926	Cambridge, Eng.	183 44 49.63	35 10 44.54	93	-12.93	+10.00
24.422078	Christiania	183 53 54.89	35 8 45.68	92-3	-22.26	+23.65
24.423542	Pulkova	183 54 10.95	35 8 29.39		-16.36	+ 9.80
25.261189	Kremsmünster	185 33 31.30	34 42 52.75	95	-13.68	+14.55
25.272704	Göttingen	185 35 5.21	34 42 29.31	97	-13.14	+14.41
25.275727	"	185 35 19.06	34 42 27.18	96	-21.39	+18.36
25.292244	Königsberg	185 37 26.04	34 41 49.07	95	-15.31	+13.75
25.285921	Liverpool	185 36 40.26	34 42 2.64	98	-14.79	+14.49
25.292886	"	185 37 27.31	34 41 49.79	98	-18.74	+15.78
25.299857	"	185 38 20.05	34 41 35.14	98	-17.07	+15.30
25.314011	Berlin	185 40 15.72	34 41 8.62	97	- 5.15	+17.63
25.325785	Cambridge, Eng.	185 41 23.38	34 40 48.39	95	-23.87	+21.46
25.352642	Greenwich	185 44 52.20	34 39 47.44		-12.29	+15.24
25.489007	Cambridge, U. S.	186 1 44.71	34 35 5.39	95	- 6.54	+18.45
25.520255	Ann Arbor	186 5 36.19	34 33 59.05	96	- 6.93	+18.58
25.648289	Durham	186 21 26.18	34 29 18.03	95	-11.63	+14.59
25.667479	"	186 23 47.69	34 28 37.93	95	-13.85	+16.65
26.298863	Geneva	187 44 6.99	34 3 46.23	98	-18.40	+11.15
26.306382	Bonn	187 45 11.32	34 3 29.86	99	-12.62	+13.69
26.484109	Christiania	188 8 21.71	33 55 50.83	98	-13.95	+ 9.52
26.527307	Washington	188 14 4.57	33 53 58.36	99	-11.54	+10.03
26.531339	Ann Arbor	188 14 32.82	33 53 52.01	99	-15.15	+14.33
26.322762	Durham	187 47 18.92		98	-12.67	
26.339268	"	187 49 25.98		98	-14.35	
26.346136	"		34 1 52.60	98		+16.76
27.242312	Kremsmünster	189 50 3.90	33 20 26.11	100	-15.03	+15.02
27.278053	Florence	189 54 52.02	33 18 29.13	100	-21.23	+ 6.36
27.279344	Bonn	189 55 13.95	33 18 31.70	100	- 9.94	+12.86
27.286224	Geneva	189 56 5.07	33 18 6.62	100	-15.56	+10.26
27.293169	Liverpool	189 56 45.38	33 17 50.51	103	-32.62	+13.76
27.320928	Cambridge, Eng.	190 0 55.60	33 16 25.90	100	-11.51	+14.06
27.360644	Christiania	190 6 22.42	33 14 25.88	100	-13.25	+16.27
27.368878	Armagh	190 8 5.00	33 12 51.72	100	+21.11	+ 7.56
28.259639	Kremsmünster	192 13 38.59	+32 24 1.27	105	-14.00	+13.79

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Sept. 28.279187	Bonn	192° 16' 33".12	+32° 22' 51".95	102	— 9".72	+15".84
28.292041	Paris	192 18 24.52	32 22 7.66	105	—10.37	+18.61
28.299010	Copenhagen	192 19 25.03	32 22 47.15	102	—10.64	+83.66
28.307004	"	192 20 17.27			—28.15	
28.326205	Durham	192 23 30.97	32 20 2.45	101	— 2.10	+19.01
28.506643	Washington	192 49 51.07	32 9 57.40	105	— 7.10	+90.12
29.260515	Kremsmünster	194 42 44.06	31 17 38.66	104	—15.74	+17.75
29.263858	Vienna	194 43 20.04	31 17 22.20	112-3	—10.41	+15.78
29.268433	Königsberg	194 43 55.92	31 17 3.25	109	—16.49	+16.68
29.281328	Leyden	194 46 4.00		107	— 6.72	
29.284939	Florence	194 46 20.95	31 15 58.15	106	—22.91	+23.32
29.293825	Göttingen	194 47 12.72	31 14 27.20	108	—52.74	+31.07
29.303599	Vienna	194 49 25.47	31 14 26.76	104	— 9.77	+13.28
29.323978	Geneva	194 52 22.65	31 12 49.99	104	—10.75	+ 1.24
29.498277	Cambridge, U. S.	195 19 17.55	31 0 5.74	112	—15.54	+16.24
29.505309	Washington	195 20 39.97	30 59 33.17	112	+ 1.62	+15.39
29.708542	Greenwich	195 52 4.65	30 43 56.43		— 9.47	+11.88
30.207585	Pulkova	197 10 52.77	30 3 30.84	115	—15.05	+12.96
30.227222	"	197 14 4.05	30 1 54.13	115	—12.25	+15.75
30.257998	Kremsmünster	197 18 58.29	29 59 16.75	114	—13.70	+14.94
30.263155	Liverpool	197 19 53.58	29 58 48.95	111	— 8.03	+13.44
30.270043	Geneva	197 20 44.43	29 58 7.41	114	—14.94	+ 7.07
30.273627	Liverpool	197 21 33.97	29 57 55.89	111	— 8.37	+13.88
30.284093	"	197 23 11.36	29 57 0.83	111	—11.71	+12.36
30.295506	Geneva	197 24 59.97	29 56 4.30	110	—13.00	+14.33
30.314046	Markree	197 27 57.13	29 54 40.09	116	—14.49	+25.37
30.320418	Armagh	197 28 27.61	29 53 52.46	114	—45.43	+10.53
30.335823	Cambridge, Eng.	197 31 27.60	29 52 40.33	116	—14.03	+17.84
30.342848	Armagh	197 32 10.53	29 52 7.19	116	—38.89	+20.97
30.501681	Washington	197 58 19.42	29 38 11.42	116	— 8.92	+16.37
30.533553	"	198 4 1.45	29 35 4.29	117	+22.99	— 1.49
30.323109	Durham	197 29 30.83		116	— 8.17	
30.334899	"		29 52 43.32	116		+16.06
Oct. 1.268006	Kremsmünster	200 4 28.15	28 26 19.30	122	—13.99	+10.99
1.295157	Greenwich	200 9 6.30	28 23 40.45		— 8.55	+13.98
1.300854	Göttingen	200 9 54.20	28 23 4.11	122	—17.99	+11.72
1.300854	"	200 9 56.05	28 23 12.04	123	—16.14	+19.65
1.311247	Geneva	200 11 43.22	28 22 0.09	122	—13.36	+ 8.83
1.312189	Leyden	200 11 57.08		124	— 8.79	
1.350841	Christiania	200 18 34.24	28 18 7.24	121	— 2.79	+16.49
1.507696	Washington	200 44 39.17	28 2 23.24	120	—20.96	+26.08
2.263880	Königsberg	202 54 21.88	26 40 19.60	125	— 9.63	+18.78
2.264704	Vienna	202 54 35.63	26 40 0.05	126	— 8.62	+ 7.72
2.268121	Kremsmünster	202 55 2.46	26 39 43.59	126	—14.25	+12.60
2.285332	Greenwich	202 58 7.20	26 37 48.19		— 8.83	+15.30
2.286363	Geneva	202 58 16.03	26 37 35.34	128	—10.74	+ 9.53
2.287888	Leyden	202 58 36.73		126	— 5.95	
2.300320	Christiania	203 0 39.16	26 36 4.47	125	—13.12	+14.64
2.300320	"	203 0 42.22	26 36 3.14	126	—10.06	+13.31
2.304222	Geneva	203 1 16.27	26 35 31.18	125	—16.69	+10.39
2.304203	Florence	203 1 24.76	26 35 33.99	125	— 9.04	+11.60
2.509941	Washington	203 37 20.32	26 11 41.67	127	—13.33	+20.39
3.257362	Christiania	205 49 35.43	24 39 9.16	118	—11.51	+21.07
3.270639	Kremsmünster	205 51 58.36	24 37 15.00	132	—11.16	+10.48
3.272642	Vienna	205 52 16.67	+24 36 58.69	130	—14.36	+ 9.83

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Oct. 3.284526	Bonn	205° 54' 28.85	+24° 35' 30.35	129	— 9.85	+14.36
3.290934	Geneva	205 55 35.48	24 34 31.04	133	—12.08	+ 5.19
3.308712	"	205 58 49.85	24 32 15.86	130	— 8.82	+ 9.33
3.530868	Washington	206 38 46.64	24 2 50.88	131	— 7.97	+11.12
4.224497	Berlin	208 44 54.47	22 25 47.75	134	— 7.10	+13.51
4.243681	Vienna	208 48 26.32	22 23 13.59	134	— 6.14	+27.13
4.251518	Liverpool	208 49 55.98	22 21 51.55	138	— 2.64	+13.74
4.258040	Vienna	208 50 59.54	22 20 51.68	135	—10.81	+11.04
4.262837	Kremsmünster	208 51 55.80	22 20 11.16	134	— 7.31	+12.59
4.265508	Liverpool	208 52 31.20	22 19 47.54	138	— 1.30	+12.42
4.279468	"	208 55 1.54	22 17 46.22	138	— 4.51	+13.71
4.283145	Göttingen	208 55 45.53	22 17 23.01	136	— 0.99	+22.82
4.287557	Leyden	208 56 37.45	22 16 33.54	136	+ 2.39	+12.16
4.299512	Durham	208 58 50.63		136	+ 4.00	
4.303897	Geneva	208 59 18.72	22 14 4.14	134	—16.18	+ 6.66
4.308288	Durham		22 13 32.19	136		+13.42
4.316911	"	209 2 0.96		136	+ 2.78	
4.334335	Markree	209 5 7.55	22 9 33.66	136	— 2.52	+ 4.91
5.204358	Berlin	211 46 12.01	19 55 14.35	138	+ 1.71	+ 4.58
5.204722	Vienna	211 46 5.12	19 55 21.54	138	— 9.23	+15.30
5.205456	Pulkova	211 46 13.80	19 55 12.84	138	— 8.74	+13.68
5.217774	Königsberg	211 48 32.30	19 53 12.25	138	— 7.91	+12.39
5.218247	Pulkova	211 48 39.50	19 53 7.27	138	— 6.00	+12.01
5.219959	Vienna	211 48 59.87	19 52 49.10	138	— 4.78	+10.46
5.234935	Göttingen	211 51 42.14	19 50 27.26	138	— 9.90	+13.85
5.249079	Breslau	211 54 28.07	19 47 58.98	138	— 2.12	+ 2.97
5.253226	Geneva	211 55 4.97	19 47 24.09	138	—11.59	+13.40
5.254982	Christiania	211 55 26.91	19 47 14.03	138	— 9.27	+15.42
5.275980	Bonn	211 59 23.37	19 43 47.78	138	— 7.65	+13.59
5.285601	Greenwich	212 1 9.15	19 42 12.83		— 9.49	+12.44
5.285703	Markree	212 1 17.04	19 42 15.95	138	— 2.75	+16.56
5.291148	Armagh	212 2 17.13	19 41 13.71	138	— 3.60	+ 7.46
5.299001	Geneva	212 3 38.23	19 40 2.00	139	—10.33	+12.40
5.302480	Cambridge, Eng.	212 4 21.40	19 39 23.24	138	— 6.07	+ 7.63
5.313001	Durham	212 6 20.02		139	— 5.20	
5.324932	"		19 35 48.01	139		+12.00
5.506095	Washington	212 42 19.31	19 5 58.72	140	—10.13	+11.89
5.513707	Ann Arbor	212 43 46.90	19 4 42.00	137	— 7.94	+11.00
6.223085	Berlin	214 56 56.76	17 3 5.99	143	— 4.30	+12.95
6.243362	Christiania	215 0 43.33	16 59 31.04	143	— 6.57	+13.15
6.245121	Breslau	215 1 0.08	16 59 5.37	143	— 9.68	+ 6.18
6.259660	Göttingen	215 3 45.60	16 56 40.65	143	— 8.24	+15.76
6.268458	Geneva	215 5 21.56	16 55 2.18	142	—11.60	+11.08
6.274580	"	215 6 31.88	16 53 58.80	141	—10.39	+12.86
6.276532	Göttingen	215 6 52.90		144	—11.40	
6.281182	Copenhagen	215 8 6.09	16 52 47.79		+ 9.30	+12.14
6.283378	Leyden	215 8 13.91		143	— 7.67	
6.292062	Kremsmünster	215 9 48.62	16 50 49.68	144	—11.01	+10.00
6.295746	Paris	215 10 30.22	16 50 16.69	142	—10.98	+16.28
7.223698	Berlin	218 5 29.88	13 59 20.99	148	— 4.97	+ 8.83
7.233783	Vienna	218 7 27.10	13 57 27.63	149	— 1.74	+10.48
7.243249	Kremsmünster	218 9 8.42	13 55 40.48	148	— 7.50	+11.42
7.245732	Vienna	218 9 37.35	13 55 12.90	149	— 6.61	+12.24
7.246070	Breslau	218 9 31.48	13 55 2.98	147-9	—16.35	+ 6.16
7.262217	Kremsmünster	218 12 44.56	+13 52 3.43	148	— 5.82	+10.75

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Oct. 7.283573	Geneva	218° 16' 46.97	+13° 47' 59.50	146	— 4.87	+11.53
7.285147	"	218 16 58.14	13 47 42.69	151	—11.50	+12.74
7.291893	Göttingen	218 18 16.98	13 46 28.98	148	— 8.93	+16.28
7.301455	Florence	218 20 4.61	13 44 24.33	146	— 9.40	+ 1.19
7.307955	Durham	218 21 19.72	13 43 39.05	146	— 7.77	+30.43
7.319152	Markree	218 23 26.57	13 41 6.23	151	— 7.51	+ 6.05
7.326498	Armagh	218 24 50.37	13 39 49.65	151	— 6.74	+13.78
8.228454	Breslau	221 14 27.66	10 42 54.76	152-3	— 6.84	+25.18
8.231321	Kremsmünster	221 15 4.35	10 42 8.57	152	— 2.40	+13.61
8.243545	Bonn	221 17 19.32	10 39 36.69	154	— 4.85	+ 9.15
8.264194	Göttingen	221 21 14.02		155	— 2.27	
8.266683	Paris	221 21 41.47	10 35 3.07	152	— 2.80	+14.90
8.266998	Liverpool	221 21 35.40	10 34 51.86	150	—12.42	+ 7.52
8.275565	Göttingen		10 33 7.11	155		+ 6.28
8.276015	Florence	221 23 17.71	10 32 56.76	152	—11.46	+ 1.37
8.279737	Altona	221 23 58.29	10 32 12.74	154	—12.70	+ 2.31
8.279866	Leyden	221 24 12.91		152	+ 0.49	
8.294975	Liverpool	221 26 57.68	10 29 16.75	150	— 4.56	+10.59
8.296998	Armagh	221 27 26.35	10 28 51.13	152	+ 1.39	+ 9.44
8.298771	Cambridge, Eng.	221 27 34.94	10 28 30.68	154	— 9.95	+ 9.42
8.311355	Leyden		10 25 59.79	152		+11.83
8.347951	Markree	221 36 20.06	10 18 31.69	154	—37.30	+ 7.08
8.994392	Batavia	223 37 18.09	8 6 22.90		—14.23	+19.45
9.231500	Christiania	224 21 25.29	7 16 55.62	174	— 4.68	+10.06
9.233137	Pulkova	224 21 41.92	7 16 33.77	158	— 6.23	+ 8.73
9.253497	Göttingen	224 25 39.65	7 12 15.59	159	+ 5.57	+ 5.52
9.263202	Altona	224 27 9.79	7 10 16.79	159-62	—11.95	+ 8.30
9.266902	Königsberg	224 27 50.13	7 9 31.58	159	—12.66	+ 9.47
9.268608	Greenwich	224 28 17.10	7 9 10.90		— 0.68	+10.16
9.275645	Geneva	224 29 38.63	7 7 40.58	165	— 1.14	+ 8.04
9.277736	Göttingen	224 30 7.98	7 7 15.21	159	+ 5.03	+ 8.87
9.282223	Paris	224 30 48.43	7 6 17.56	156	— 4.29	+ 7.49
9.282566	Geneva	224 30 43.79	7 6 7.43	164	—12.73	+ 1.66
9.312163	Cambridge, Eng.	224 36 20.97	6 59 59.69	161	— 3.69	+ 5.21
9.495923	Washington	225 10 50.23	6 20 51.92	157	+31.34	—31.71
9.496575	Ann Arbor	225 10 26.00	6 21 20.16	160	— 0.09	+ 4.63
10.224865	Christiania	227 23 39.55	3 47 17.21	176	—20.35	+ 3.77
10.254573	Kremsmünster	227 28 53.28	3 40 59.55	166	— 6.49	+ 5.32
10.267580	Altona	227 31 12.00	3 38 15.43	166	— 9.19	+ 7.15
10.309878	Armagh	227 38 46.19	3 29 15.99	163	—14.63	+ 7.59
10.987956	Batavia	229 40 28.31	1 4 11.49		—16.69	—28.46
11.238792	Kremsmünster	230 25 8.58	0 11 16.82	169	— 4.78	+ 1.73
11.266800	Vienna	230 29 55.06	0 5 27.48	168	—14.97	+ 9.92
11.274023	Cape 1	230 31 11.64	0 3 52.07	168	—14.85	+ 6.91
11.274066	Greenwich	230 31 24.90	0 3 49.50		— 2.05	+ 3.69
11.296548	Armagh	230 35 27.26	+ 0 0 6.50	167	+ 2.42	+50.76
11.297047	Leyden	230 35 7.51	— 0 1 3.06	168	—22.62	+ 5.38
11.310513	Markree	230 37 48.17	0 3 57.06	168	— 4.36	+ 3.21
11.313423	Cambridge, Eng.	230 38 18.92	0 4 37.88	170	— 4.38	— 0.49
12.269342	Altona	233 24 24.30	3 26 22.83	171-3	+ 3.31	+ 4.99
12.270434	Cape 1	233 24 0.80	3 26 34.39	172	—31.39	+ 6.08
12.280254	Paris	233 26 8.65	3 28 33.88	175	— 4.17	+10.85
12.982945	Batavia	235 24 35.70	5 54 11.79		— 6.64	— 0.68
13.213628	Pulkova	236 2 43.19	6 40 46.99	181	—12.35	+24.10
13.255055	Geneva	236 9 39.78	— 6 49 28.88	180	— 5.28	+ 5.65

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Oct. 13.277955	Liverpool	236° 13' 34".28	— 6° 54' 6".25	182	+ 3".14	+ 6".41
13.287219	Florence	236 14 0.26	6 54 37.67	180	+ 6.15	+ 3.25
13.288445	Liverpool	236 15 19.72	6 56 14.72	182	+ 5.08	+ 5.27
13.488816	Washington	236 48 8.43	7 36 41.60	177	+ 4.97	— 0.12
13.508620	Ann Arbor	236 51 16.00	7 40 41.80	179	— 1.20	— 2.08
14.234268	Geneva	238 47 40.71	10 3 39.86	186	— 4.92	+ 0.52
14.256363	"	238 51 12.38	10 8 0.59	190	— 2.61	— 1.21
14.256363	"	238 51 9.36	10 7 56.95	194	— 5.63	— 4.85
14.261041	Kremsmünster	238 51 55.57	10 8 50.99	194	— 3.73	+ 0.04
14.271791	Cape 1	238 53 35.95	10 10 50.70	183	— 5.11	+ 4.95
14.287875	"	238 56 7.05	10 13 58.57	183	— 6.17	+ 3.38
14.528756	Ann Arbor	239 34 4.89	11 0 10.88	184	+ 5.45	+ 2.62
15.239372	Geneva	241 22 54.89	13 12 46.38	197	— 6.90	+ 4.10
15.240280	Vienna	241 23 7.16	13 12 59.52	188	— 2.84	+ 0.88
15.241461	Göttingen	241 23 24.24	13 13 8.86	191	+ 3.55	+ 4.49
15.243991	Kremsmünster	241 23 37.26	13 13 39.29	197	— 6.32	+ 0.75
15.247077	Göttingen	241 24 14.36	13 14 21.93	189	+ 2.84	— 7.09
15.256351	Florence	241 25 31.52	13 15 55.77	196	— 3.90	+ 0.56
15.256407	Liverpool	241 25 34.18	13 15 57.40	213	— 1.77	— 0.45
15.259106	Geneva	241 25 59.61	13 16 21.25	185	— 0.75	+ 5.25
15.286250	Cambridge, Eng.	241 29 56.64	13 21 30.43	196	— 9.08	— 7.24
15.316533	Cape 1	241 34 25.22	13 26 51.51	193	— 13.86	+ 2.14
15.499105	Washington	242 1 57.44	13 59 51.88	195	— 1.47	+ 20.70
15.503998	Ann Arbor	242 2 46.28	14 0 45.35	187	+ 2.56	— 0.05
16.231845	Breslau	243 49 15.80	16 9 2.62	200	+ 0.19	— 47.67
16.234474	Bonn	243 49 35.41	16 8 44.87	199	— 2.88	— 2.97
16.234960	Berlin	243 49 43.56	16 8 48.85	198	+ 1.21	— 1.96
16.240516	Vienna	243 50 31.08	16 9 49.33	200	+ 0.70	— 5.59
16.242347	Göttingen	243 50 43.61	16 10 9.11	199	— 2.56	— 6.59
16.245888	Altona	243 51 20.48	16 10 28.13	199	+ 3.80	+ 10.62
16.257474	Florence	243 53 1.93	16 12 51.81	201	+ 5.43	— 14.54
16.270196	Cambridge, Eng.	243 54 41.20	16 14 42.87	201	— 4.86	+ 4.44
16.271260	Paris	243 54 55.08	16 14 55.92	201	— 0.15	+ 2.24
16.277275	Cape 1	243 55 45.29	16 15 58.81	192	— 1.70	+ 0.82
16.287908	Armagh	243 57 24.89	16 16 35.73	201	+ 6.42	+ 72.43
16.288004	Cape 2	243 57 13.13	16 17 47.31	201	— 6.17	+ 1.83
16.292798	Markree	243 58 0.03	16 18 41.71	201	— 0.48	— 3.67
16.296702	Cape 1	243 58 31.73	16 19 17.80	192	— 2.38	+ 0.08
16.318776	Cape 2	244 1 33.08	16 23 0.71	201	— 10.66	+ 2.06
16.501781	Washington	244 27 47.24	16 53 51.26	199	— 0.90	+ 2.28
17.224979	Vienna	246 8 24.59	18 51 37.14	203	— 0.96	+ 2.68
17.237201	"	246 10 5.33	18 53 39.33	203	— 3.73	+ 0.43
17.258608	Geneva	246 12 59.23	18 57 1.17	206	— 5.03	+ 1.73
18.000873	Batavia	247 52 5.86	20 50 46.13		— 14.59	+ 9.25
18.229243	Vienna	248 21 57.50	21 24 30.24	205	— 8.58	+ 5.21
18.241802	Geneva	248 23 37.72	21 26 26.89	202	— 5.93	— 0.43
18.259592	"	248 25 58.24	21 28 54.26	209	— 3.49	+ 6.80
18.270142	Cape 1	248 27 23.57	21 30 31.30	204	+ 0.03	+ 1.92
18.285490	Cape 2	248 29 21.63	21 32 45.94	207	— 0.86	+ 1.21
18.285490	"	248 29 21.93	21 32 42.07	209	— 0.56	+ 5.08
18.285797	Cape 1	248 29 26.42	21 32 44.76	204	+ 1.54	+ 1.35
18.299314	Cape 2	248 31 6.06	21 34 45.36	207	— 3.49	+ 2.28
18.299314	"	248 31 7.26	21 34 42.86	209	— 2.29	+ 4.78
18.305006	Cape 1	248 31 53.66	21 35 35.47	204	+ 0.05	+ 1.74
18.322705	Cape 2	248 33 53.28	— 21 38 9.85	207	— 17.23	+ 1.34

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Oct. 18.322705	Cape 2	248° 33' 54.33	—21° 38' 7.77	209	—16.18	+ 3.42
19.002366	Batavia	250 0 7.86	23 13 49.14		— 1.78	+ 3.58
19.452976	Cambridge, U. S.	250 55 27.49	24 14 13.54	210	+ 1.62	+ 4.77
19.494892	Washington	251 0 32.11	24 19 46.55	208	+ 1.94	+ 1.80
20.454666	Cambridge, U. S.	252 53 30.05	26 20 15.44	211	+ 1.39	+ 5.44
21.264748	Cape 2	254 24 12.23	27 54 18.61	212	— 3.14	+ 2.07
21.264748	"	254 24 15.98	27 54 18.64	214	+ 0.61	+ 2.04
21.275041	Cape 1	254 25 20.30	27 55 28.28	216	— 2.70	+ 1.42
21.278415	Cape 2	254 25 43.22	27 55 49.45	212	— 1.95	+ 2.88
21.278415	"	254 25 39.32	27 55 53.33	214	— 5.85	— 1.00
21.291348	"	254 27 0.37	27 57 19.44	212	— 9.70	— 0.48
21.291348	"	254 27 5.32	27 57 24.08	214	— 4.75	— 5.12
21.291348	"	254 27 2.92	27 57 20.73	218	— 7.15	— 1.77
21.304881	Cape 1	254 28 34.31	27 58 49.18	216	— 4.56	+ 0.33
21.305007	Cape 2	254 28 34.76	27 58 46.55	212	— 4.94	+ 3.80
21.305007	"	254 28 25.41	27 58 50.29	214	—14.29	+ 0.06
21.312209	Cape 1	254 29 23.87	27 59 37.80	217	— 3.06	+ 0.69
21.331513	"	254 31 31.57	28 1 45.93	217	— 1.83	+ 1.44
21.500843	Ann Arbor	254 49 54.78	28 20 33.27	215	— 2.26	— 4.99
22.239002	Florence	256 7 51.54	29 39 14.04	223	—17.10	—35.31
22.278702	Cape 2	256 12 11.95	29 42 41.71	221	— 3.20	+ 0.20
22.278702	"	256 12 10.36	29 42 40.11	222	— 4.79	+ 1.80
22.278702	"	256 12 11.41	29 42 41.16	223	— 3.74	+ 0.75
22.284269	Cape 1	256 12 49.03	29 43 16.82	220	— 1.12	— 0.42
22.289345	Cape 2	256 13 23.57	29 43 44.51	221	+ 1.90	+ 2.94
22.289345	"	256 13 20.18	29 43 45.91	222	— 1.49	+ 1.54
22.289345	"	256 13 23.03	29 43 43.77	223	+ 1.36	+ 3.68
22.290592	Cape 1	256 13 29.05	29 43 52.60	219	— 0.36	+ 0.65
22.299591	Cape 2	256 14 22.83	29 44 47.54	221	— 2.45	+ 2.54
22.299591	"	256 14 21.09	29 44 48.28	222	— 4.19	+ 1.80
22.299591	"	256 14 18.69	29 44 48.80	223	— 6.59	+ 1.28
22.309611	"	256 15 25.94	29 45 48.96	221	— 1.50	+ 2.34
22.309611	"	256 15 25.70	29 45 49.95	222	— 1.74	+ 1.35
22.309611	"	256 15 29.45	29 45 50.73	223	+ 2.01	+ 0.57
22.312775	Cape 1	256 15 45.68	29 46 10.47	219	— 1.38	+ 0.14
22.318450	"	256 16 18.42	29 46 46.33	220	— 3.82	— 1.08
22.319024	Cape 2	256 16 17.61	29 46 45.72	221	— 8.19	+ 3.03
22.319024	"	256 16 10.47	29 46 47.92	222	—15.33	+ 0.83
22.319024	"	256 16 1.92	29 46 42.31	223	—23.88	+ 6.44
22.483971	Ann Arbor	256 33 22.80	30 3 31.72	221	+ 0.15	— 5.17
23.267205	Cape 2	257 51 40.72	31 19 14.31	224	—11.29	— 2.77
23.267205	"	257 51 53.62		226	+ 1.61	
23.280606	"	257 52 53.95	31 20 26.12	224	—16.88	+ 0.29
23.280606	"	257 52 43.45	31 20 26.39	226	— 6.38	+ 0.02
23.288695	"	257 53 48.86	31 21 9.07	224	— 9.51	+ 2.67
23.288695	"	257 53 57.11	31 21 12.89	226	— 1.26	— 0.15
23.289249	Cape 1	257 53 56.37	31 21 13.60	225	— 4.25	+ 1.24
23.295526	Cape 2	257 54 21.53	31 21 52.66	224	—16.96	— 2.76
23.295526	"	257 54 30.23	31 21 50.95	226	— 8.26	— 1.05
23.302760	"	257 55 8.13	31 22 29.71	224	—12.86	+ 0.57
23.302760	"	257 55 26.13	31 22 28.43	226	+ 5.14	+ 1.85
23.309794	Cape 1	257 55 58.76	31 23 10.07	225	— 3.52	— 0.54
23.327418	"	257 57 41.92	31 24 48.95	225	— 3.74	— 1.20
24.270223	"	259 27 32.31	32 48 36.57	227	— 1.42	+ 5.01
24.291839	"	259 29 32.03	—32 50 31.24	227	— 2.03	+ 0.85

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Oct. 24.297234	Cape 2	259° 29' 49.22	—32° 51' 1.49	227	—14.85	— 1.86
24.310027	"	259 31 11.13	32 52 4.42	227	— 4.07	+ 0.48
24.310027	"	259 31 16.53	32 52 6.29	228	+ 1.33	— 1.39
24.310359	Cape 1	259 31 13.53	32 52 5.50	227	— 3.51	+ 1.09
24.320564	Cape 2	259 31 42.71	32 53 5.54	227	—31.04	— 6.94
24.320564	"	259 31 52.61	32 53 1.05	228	—21.14	— 2.45
24.330842	"	259 32 59.55	32 54 0.14	227	—11.29	— 9.20
24.330842	"	259 33 9.30	32 53 48.45	228	— 1.54	+ 2.49
25.227393	Florence	260 53 53.91	34 6 59.10	229	—15.89	— 2.01
25.270231	Cape 1	260 57 54.27	34 10 16.66	229	— 1.94	+ 1.42
25.271213	Cape 2	260 57 57.74	34 10 19.08	229	— 3.65	+ 3.58
25.282375	"	260 58 58.75	34 11 12.24	229	— 6.54	+ 2.67
25.291788	Cape 1	260 59 46.79	34 11 57.90	229	— 3.15	+ 1.03
25.293562	Cape 2	260 59 59.88	34 12 3.38	229	+ 0.58	+ 3.85
25.304389	"	261 0 50.73	34 12 54.18	229	— 5.64	+ 3.63
25.315282	"	261 1 46.80	34 13 45.56	229	— 6.95	+ 3.09
25.318415	Cape 1	261 2 5.27	34 14 1.35	230	— 4.99	+ 1.91
26.278599	Cape 2	262 24 18.84	35 25 45.54	232	— 1.14	— 7.08
26.284208	Cape 1	262 24 45.07	35 26 1.73	231	— 3.00	+ 0.82
26.293092	Cape 2	262 25 33.24	35 26 38.90	231	+ 0.71	+ 1.72
26.302328	Cape 1	262 26 16.43	35 27 19.84	231	— 2.28	+ 0.33
26.314169	Cape 2	262 27 11.32	35 28 10.74	231	— 6.59	+ 0.09
26.326702	"	262 28 10.19	35 28 58.26	231	— 5.34	+ 1.76
27.280555	Cape 1	263 45 43.72		234	— 5.26	
27.284622	Cape 2	263 45 51.16	36 34 26.62	233	—17.17	+ 6.40
27.290788	Cape 1	263 46 31.03	36 34 55.06	234	— 6.50	+ 2.22
27.302058	Cape 2	263 47 16.51	36 35 37.46	233	—14.68	+ 4.15
27.309387	Cape 1	263 47 59.50	36 36 7.06	234	— 6.51	+ 3.35
27.317984	Cape 2	263 48 44.14	36 36 36.09	233	— 2.71	+ 8.08
28.281355	"	265 2 58.83	37 37 9.95	236	—12.43	+ 7.24
28.291188	Cape 2	265 3 51.38	37 37 48.73	236	— 4.37	+ 4.07
28.296537	Cape 1		37 38 9.03	236		+ 3.13
28.317088	"	265 5 48.72	37 39 21.58	235	— 4.09	+ 4.86
28.326112	"	265 6 30.33	37 39 57.60	236	— 3.24	+ 1.42
29.272940	"	266 16 5.94	38 34 46.18	237	— 5.26	+ 0.76
29.280063	Cape 2	266 16 37.16	38 35 8.57	237	— 4.75	+ 2.16
29.291846	Cape 1	266 17 28.09	38 35 49.21	237	— 4.61	+ 0.85
29.291909	Cape 2	266 17 24.19	38 35 49.05	237	— 8.79	+ 1.22
29.304695	"	266 18 16.89	38 36 32.27	237	—11.16	+ 0.63
29.307344	Cape 1	266 18 35.52		237	— 3.93	
29.331186	"	266 20 15.91	38 37 59.43	238	— 6.15	+ 1.65
30.301428	Cape 2	267 28 16.21	39 29 46.29	239	— 4.66	— 0.52
30.311740	Cape 1	267 28 57.38	39 30 14.23	240	— 5.90	+ 3.28
30.318273	Cape 2	267 29 22.79	39 30 30.26	240	— 7.29	+ 7.34
30.328224	Cape 1	267 30 5.90	39 31 6.00	240	— 5.04	+ 2.19
30.530435	Santiago	267 43 57.03	39 41 20.96	240	— 0.09	+ 3.60
31.295670	Cape 1	268 34 49.84	40 18 43.51	242	+ 0.67	+ 2.96
31.298280	Cape 2	268 34 53.81	40 18 50.34	241	—12.70	+ 8.71
31.306177	Cape 1	268 35 53.96	40 19 35.56	242	— 6.42	+ 2.56
31.319299	Cape 2	268 36 17.65	40 19 54.19	241	—11.41	+ 4.72
31.328081	Cape 1	268 36 56.93	40 20 20.59	242	— 6.60	+ 3.30
31.551379	Santiago	268 51 36.28	40 30 49.08	241	+ 0.85	+ 4.52
31.568757	"	268 52 32.10		241	—10.74	
Nov. 2.369050	Cape 2	270 44 42.82	—41° 50' 6.22	243	— 7.41	+ 0.79
2.516770	Santiago	270 53 37.97		244	— 2.09	

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Nov. 3.277366	Cape 1	271° 38' 12.72"	42° 25' 55.35"	247	— 6.45	+ 2.12
3.278903	Cape 2	271 38 19.65	42 25 58.20	248	— 4.84	+ 2.80
3.293061	"	271 39 11.22	42 26 30.51	248	— 2.38	+ 2.93
3.309289	Cape 1	271 40 0.63	42 27 7.70	246	— 9.23	+ 2.87
3.317423	"		42 27 24.68	246		+ 4.50
3.536300	Santiago	271 53 6.60	42 35 42.91	251	— 6.38	+ 2.80
3.624757	"	271 58 11.93	42 38 59.81	251	— 4.32	+ 4.40
3.630955	"	271 58 26.58		253	— 10.33	
4.276278	Cape 2	272 34 43.01	43 2 49.28	252	— 15.65	+ 0.53
4.288704	Cape 1	272 35 31.25	43 3 12.07	250	— 8.89	+ 4.31
4.298756	Cape 2	272 36 7.70	43 3 37.54	252	— 5.98	+ 0.32
4.303762	Cape 1	272 36 22.17	43 3 43.33	250	— 8.22	+ 5.22
4.535387	Santiago	272 49 6.15	43 11 55.03	245	— 13.43	+ 4.29
5.284601	Cape 2	273 29 48.34	43 37 27.19	254	— 14.84	+ 8.22
5.309511	"	273 31 5.05	43 38 16.31	254	— 18.25	+ 8.87
5.542071	Santiago	273 43 38.20	43 46 3.74	249	— 9.54	+ 2.16
6.064230	Batavia	274 11 8.70	44 2 27.45	254	— 14.63	+ 31.54
6.284801	Cape 2	274 22 42.76	44 9 49.79	256	— 2.12	+ 1.59
6.290045	Cape 1	274 22 50.80	44 9 57.28	255	— 10.37	+ 3.92
6.304504	Cape 2	274 23 38.85	44 10 30.04	256	— 7.22	— 1.77
6.305375	Cape 1	274 23 37.36	44 10 25.97	255	— 11.42	+ 3.93
6.532629	Santiago	274 35 19.30	44 17 27.91	254	— 12.16	+ 4.14
7.280508	Cape 2	275 13 15.71	44 39 53.10	257	— 10.70	+ 6.01
7.292731	"	275 13 57.76	44 40 14.11	257	— 2.37	+ 6.49
7.303347	"	275 14 19.35	44 40 33.40	257	— 15.66	+ 5.83
7.309731	Cape 1	275 14 42.67	44 40 44.70	257	— 11.50	+ 5.77
7.344515	"	275 16 28.11		257	— 10.70	
9.323115	Cape 2	276 51 59.05	45 36 11.76	258	— 29.63	+ 5.23
9.335328	Cape 1	276 52 32.98	45 36 31.33	258	— 30.19	+ 4.69
9.335882	Cape 2	276 52 51.74	45 36 26.63	258	— 12.93	+ 10.22
9.352831	Cape 1	276 53 38.95		258	— 13.47	
9.518349	Santiago	277 1 19.81	45 41 16.09	258	— 17.66	+ 2.74
9.543581	"	277 2 33.13	45 41 56.89	258	— 15.04	+ 0.70
11.282643	Cape 1	278 21 46.97	46 24 14.60	259	— 13.47	+ 3.24
11.297551	"	278 22 26.77	46 24 34.49	259	— 13.42	+ 4.06
11.314855	"	278 23 12.24		259	— 14.09	
11.538432	Santiago	278 33 5.98	46 30 10.01	261	— 14.46	+ 0.97
12.285219	Cape 1	279 5 46.91	46 46 51.73	260	— 12.96	+ 2.35
12.301348	Cape 2	279 6 37.03	46 47 11.97	262	— 4.75	+ 3.34
12.304447	Cape 1	279 6 35.60	46 47 16.71	260	— 14.23	+ 2.68
12.324950	Cape 2	279 7 23.58	46 47 40.41	262	— 19.49	+ 5.92
14.318331	Cape 1	280 31 36.40	47 29 6.64	263	— 17.17	+ 4.81
14.329283	"	280 32 4.18	47 29 20.97	263	— 16.49	+ 3.44
14.522421	Santiago	280 40 14.47	47 33 8.22	267	— 20.02	+ 3.53
14.532038	"	280 40 19.50		263	— 21.55	
15.295493	Cape 1	281 11 29.82	47 47 55.49	265	— 15.34	+ 4.58
15.298458	Cape 2	281 11 39.45	47 48 0.71	263	— 12.89	+ 2.60
15.313592	"	281 12 9.87	47 48 14.55	266	— 19.11	+ 5.81
15.323250	Cape 1	281 12 35.12	47 48 26.81	265	— 17.24	+ 4.42
15.534608	Santiago	281 20 53.70	47 52 21.16	264	— 28.95	+ 6.74
16.327195	Cape	281 52 37.43	48 6 48.25	268	— 18.66	+ 5.70
16.335931	"		48 6 57.27	268		+ 6.05
17.301841	"	282 30 47.62	48 23 49.49	269	— 15.39	+ 5.35
17.338512	"	282 32 11.74		269	— 16.47	
17.542119	Santiago	282 39 55.49	48 27 57.07	269	— 24.64	+ 2.37

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Nov. 18.318259	Cape	283° 9' 44.52	—48° 40' 46.30	271	—18.12	+ 4.96
18.545262	Santiago	283 18 3.81	48 44 21.34	271	—35.40	+ 9.56
19.306291	Cape	283 47 1.08	48 56 29.14	272	—14.78	+ 6.31
19.324727	"	283 47 43.46	48 56 45.77	272	—13.71	+ 6.91
19.342447	"	283 48 22.28		272	—13.98	
19.526554	Santiago	283 55 16.12		272	—12.36	
19.537712	"	283 55 33.25	49 0 6.19	270	—20.14	+ 4.49
20.298313	Cape	284 23 44.33	49 11 39.33	273	—16.03	+ 3.67
20.312796	"	284 24 14.57	49 11 51.54	273	—17.71	+ 4.42
20.327914	"	284 24 50.91		273	—14.69	
20.553316	Santiago	284 32 58.99	49 15 25.53	273	—22.99	+ 4.57
21.310521	Cape	285 0 38.45	49 26 24.96	274	—15.20	+ 5.20
21.325433	"	285 1 9.24	49 26 38.00	274	—16.76	+ 4.96
21.342125	"	285 1 45.37		274	—16.83	
22.337353	"	285 37 22.65	49 40 44.27	275	—21.80	+ 8.54
22.354590	"	285 38 2.02		275	—19.26	
22.543740	Santiago	285 44 41.29	49 43 38.53	277	—23.56	+ 3.35
24.536028	"	286 54 22.66	50 9 38.78	276	—30.78	+ 6.39
26.31198	Cape	287 55 18.16	50 31 18.06	278	—22.57	+ 4.39
26.33066	"	287 55 54.92	50 31 29.58	278	—23.80	+ 6.08
27.30696	"	288 28 48.68	50 42 45.26	279	—23.98	+ 8.32
27.33047	"	288 29 33.10		279	—26.84	
27.54048	Santiago	288 36 27.31	50 45 34.04	282	—34.51	— 1.72
29.31176	Cape	289 35 21.13	51 4 49.73	280	—24.75	+ 6.31
29.33565	"	289 36 5.80		280	—27.23	
30.55715	Santiago	290 16 4.11		281	—25.75	
Dec. 2.31849	Cape	291 13 3.71	51 35 19.27	283	—20.32	+ 5.70
2.34125	"	291 13 45.93		283	—21.91	
2.54202	Santiago	291 20 2.94	51 37 26.70	283	—31.14	+ 7.61
3.31831	Cape	291 44 55.07	51 44 51.74	284	—27.05	+ 5.31
3.32911	"	291 45 16.05	51 44 59.38	284	—24.77	+ 3.18
3.34460	"	291 45 44.62	51 45 8.83	284	—27.72	+ 3.03
3.53935	Santiago	291 51 52.46	51 46 39.08	284	—31.91	+ 22.20
3.55992	"	291 52 26.16		285	—37.45	
3.56003	"	291 52 31.83	51 47 0.59	286	—31.99	+ 12.27
4.31389	Cape	292 16 29.01	51 54 3.78	285	—29.96	+ 6.83
4.33605	"	292 17 14.40	51 54 16.34	285	—26.67	+ 6.42
4.54287	Santiago	292 23 40.65	51 56 9.68	286	—32.91	+ 6.07
5.31285	Cape	292 48 5.50	52 3 6.04	287	—24.65	+ 4.85
5.33431	"	292 48 48.04	52 3 15.81	287	—22.62	+ 6.54
6.30326	"	293 19 5.90	52 11 49.21	288	—28.04	+ 3.25
6.30754	"	293 19 16.67	52 11 47.18	289	—25.30	+ 7.50
6.32438	"	293 19 43.38	52 11 58.79	288	—32.07	+ 5.17
6.32800	"	293 19 55.45	52 12 0.96	289	—24.86	+ 4.35
6.34854	"	293 20 33.79		288	—25.11	
6.35494	"	293 20 44.35		289	—26.57	
6.55325	Santiago	293 26 48.31	52 13 50.46	289	—33.43	+ 11.52
6.57384	"		52 14 7.61	289		+ 5.00
7.55036	"	293 57 46.77	52 22 21.15	290	—39.39	+ 9.40
8.30847	Cape	294 21 25.76	52 28 45.08	291	—30.71	+ 3.81
8.33255	"	294 22 5.14		291	—36.04	
8.55917	Santiago	294 28 59.09	52 30 48.53	292	—42.62	+ 4.01
9.55143	"	294 59 40.93	52 38 54.12	292	—36.59	+ 0.57
10.31458	Cape	295 23 9.19	52 44 56.24	294	—34.61	+ 1.95
10.32712	"	295 23 34.77	—52 45 2.94	294	—32.09	+ 1.17

Paris M. T. of Observation. 1858.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Dec. 10.34029	Cape	295° 23' 59".59	—52° 45' 8".07	294	—31".50	+ 2".26
10.35130	"	295 24 16.74		294	—34.60	
10.52539	Santiago	295 30 41.38	52 46 48.94	293	—39.31	+ 6.28
11.31853	Cape	295 54 1.61	52 52 45.94	294	—25.15	+ 1.23
11.34878	"	295 54 53.01		294	—29.17	
11.55938	Santiago	296 1 4.80	52 54 45.46	300	—42.99	— 7.29
12.30595	Cape	296 24 3.24	53 0 11.88	296	—28.91	+ 6.88
12.31831	"	296 24 26.16	53 0 20.06	296	—28.55	+ 4.30
13.55581	Santiago	297 2 23.83	53 9 38.42	295	—22.23	+ 3.52
14.31744	Cape	297 24 59.08	53 15 8.23	298	—30.73	+ 3.29
14.32767	"	297 25 13.25	53 15 11.01	297	—35.11	+ 4.83
14.35668	"	297 26 9.74		297	—31.17	
14.36330	"	297 26 22.17		298	—30.75	
15.55895	Santiago	298 2 7.26	53 24 2.99	297	—48.06	+ 2.54
16.56203	"	298 32 19.10	53 31 4.23	299	—44.47	+ 4.32
19.32976	Cape	299 55 11.85	53 49 59.06	301	—37.07	+ 1.23
19.34409	"	299 55 35.13		301	—39.42	
20.55650	Santiago	300 31 24.36	53 58 6.62	302	—55.79	+ 0.19
21.31330	Cape	300 54 16.50	54 3 0.84	302	—32.96	+ 1.97
21.32952	"	300 54 45.80	54 3 7.25	302	—32.56	+ 1.87
21.56149	Santiago	301 1 16.78	54 4 41.22	302	—54.82	— 1.99
22.31768	Cape	301 24 3.54	54 9 30.07	303	—34.06	+ 1.13
22.33961	"	301 24 44.02	54 9 38.56	303	—32.59	+ 0.95
22.56760	Santiago	301 31 19.79	54 11 13.49	303	—40.57	— 6.57
23.32459	Cape	301 53 58.69	54 15 53.71	304	—28.92	+ 1.73
23.34512	"	301 54 35.10	54 16 2.22	304	—28.19	+ 1.02
24.32131	"	302 23 22.88	54 22 6.89	305	—34.35	+ 4.53
24.34167	"	302 24 1.64	54 22 13.51	305	—31.72	+ 5.55
27.32038	"	303 51 51.23	54 40 36.95	308	—40.07	+ 2.01
27.34108	"	303 52 25.23	54 40 44.18	308	—42.71	+ 2.31
27.57012	Santiago	303 59 16.34	54 42 20.15	306-7	—36.92	—10.40
28.32310	Cape	304 21 29.39	54 46 41.24	309	—36.00	+ 1.08
28.34646	"	304 22 11.90		309	—34.79	
28.57124	Santiago	304 28 48.20	54 48 9.68	309	—36.09	+ 2.09
29.31586	Cape	304 50 41.74	54 52 35.74	311	—39.23	+ 3.40
29.33171	"	304 51 16.86		311	—32.12	
29.55979	Santiago	304 57 49.17	54 54 22.27	312-3	—43.08	—15.87
30.33436	Cape	305 20 43.20	54 58 39.86	312	—38.14	+ 2.62
30.34829	"	305 21 3.13	54 58 45.87	312	—42.86	+ 1.57
30.35422	"		54 58 47.25	312		+ 2.29
30.55880	Santiago	305 26 54.52	55 0 5.65	312	—63.50	— 3.44
30.57658	"		54 59 57.69	312		+10.83
31.32622	Cape	305 49 58.84	55 4 35.18	313	—37.07	— 0.88
31.34421	"	305 50 28.26	55 4 39.50	313	—37.67	+ 0.80
31.56071	Santiago	305 56 41.16	55 5 49.08	312-10	—47.31	+ 7.64
1859.						
Jan. 1.33308	Cape	306 19 32.34	55 10 24.57	314	—40.72	+ 4.03
1.34183	"		55 10 32.06	314		— 0.38
2.55729	Santiago	306 55 32.95	55 17 58.57	315	—42.76	—21.28
3.56307	"	307 25 5.29	55 23 12.00	316	—47.20	+15.74
3.58347	"		55 23 47.17	316		—12.34
4.32549	Cape	307 47 42.29	55 27 51.49	317	—36.56	+ 1.00
4.33941	"	307 48 0.56	55 27 58.46	317	—43.42	— 1.14
5.32749	"	308 17 8.43	—55 33 41.49	318	—41.41	— 2.06

Paris M. T. of Observation. 1859.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Jan. 5.33642	Cape		$-55^{\circ} 33' 43.59$	318		-1.07
5.56881	Santiago	$308^{\circ} 24' 10.86$	$55^{\circ} 35' 19.42$	317	-45.28	-16.58
5.59200	"		$55^{\circ} 34' 58.82$	317		$+12.04$
6.32873	Cape	$308^{\circ} 46' 36.88$	$55^{\circ} 39' 23.62$	319	-42.15	$+1.59$
6.34175	"	$308^{\circ} 47' 3.12$	$55^{\circ} 39' 29.44$	319	-38.92	$+0.26$
7.56549	Santiago	$309^{\circ} 23' 0.93$	$55^{\circ} 46' 34.02$	320	-44.16	-2.62
8.56182	"	$309^{\circ} 52' 19.96$	$55^{\circ} 52' 38.89$	321	-46.78	-24.67
10.56311	"	$310^{\circ} 51' 23.65$	$56^{\circ} 4' 8.39$	322	-43.70	-26.07
11.32404	Cape	$311^{\circ} 13' 47.59$	$56^{\circ} 8' 3.68$	323	-46.77	$+0.31$
11.33871	"	$311^{\circ} 14' 17.25$	$56^{\circ} 8' 7.51$	323	-43.11	$+1.53$
11.34569	"		$56^{\circ} 8' 10.78$	323		$+0.66$
11.56671	Santiago	$311^{\circ} 20' 47.05$	$56^{\circ} 9' 46.64$	322-4	-56.99	-18.84
12.33199	Cape		$56^{\circ} 13' 49.44$	325		$+1.38$
13.33141	"	$312^{\circ} 13' 4.69$	$56^{\circ} 19' 35.81$	326	-45.95	-0.68
13.34791	"	$312^{\circ} 13' 44.50$	$56^{\circ} 19' 42.70$	326	-35.49	-1.68
20.31958	"	$315^{\circ} 40' 16.81$	$57^{\circ} 0' 9.91$	328	-38.18	-3.34
20.56512	Santiago	$315^{\circ} 47' 24.00$		327	-49.91	
21.31852	Cape	$316^{\circ} 9' 55.20$	$57^{\circ} 6' 1.66$	329	-43.44	-2.39
21.32957	"	$316^{\circ} 10' 12.30$	$57^{\circ} 6' 6.83$	329	-46.10	-3.65
21.33482	"		$57^{\circ} 6' 8.27$	329		-3.23
21.57642	Santiago	$316^{\circ} 17' 45.04$	$57^{\circ} 8' 5.68$	327	-34.39	-35.18
22.57076	"	$316^{\circ} 47' 11.78$	$57^{\circ} 13' 8.83$	330	-46.21	$+15.02$
24.32387	Cape	$317^{\circ} 39' 31.81$	$57^{\circ} 23' 56.51$	332	-47.94	-5.21
24.33599	"	$317^{\circ} 39' 58.63$	$57^{\circ} 24' 0.42$	332	-42.92	-4.76
24.35405	"	$317^{\circ} 40' 24.57$	$57^{\circ} 24' 13.69$	332	-49.38	-8.39
24.56212	Santiago	$317^{\circ} 46' 42.79$	$57^{\circ} 25' 41.62$	332	-44.61	-24.56
24.58272	"		$57^{\circ} 25' 23.07$	334		$+1.41$
25.33812	Cape	$318^{\circ} 9' 58.12$	$57^{\circ} 30' 2.55$	333	-43.18	-5.29
25.57425	Santiago	$318^{\circ} 16' 45.58$		334	-60.23	
26.57324	"	$318^{\circ} 46' 52.91$		334	-50.63	
28.32678	Cape	$319^{\circ} 39' 44.87$	$57^{\circ} 48' 16.15$	335	-41.70	-6.20
28.34785	"	$319^{\circ} 40' 22.93$	$57^{\circ} 48' 22.77$	335	-40.63	-5.03
28.57594	Santiago	$319^{\circ} 47' 6.75$		334	-50.06	
29.32330	Cape	$320^{\circ} 9' 42.05$	$57^{\circ} 54' 24.91$	337	-46.43	-5.37
29.33166	"	$320^{\circ} 10' 0.52$	$57^{\circ} 54' 26.33$	337	-43.07	-3.68
29.55787	Santiago	$320^{\circ} 16' 30.68$	$57^{\circ} 55' 15.35$	338	-62.44	$+31.59$
29.57943	"		$57^{\circ} 56' 15.51$	336		-20.53
30.32274	Cape	$320^{\circ} 39' 50.59$	$58^{\circ} 0' 37.29$	339	-48.44	-4.22
30.33277	"	$320^{\circ} 40' 10.98$	$58^{\circ} 0' 43.76$	339	-46.19	-6.93
31.33586	"	$321^{\circ} 10' 33.11$	$58^{\circ} 7' 1.22$	341	-44.81	-6.40
31.57392	Santiago	$321^{\circ} 17' 53.76$	$58^{\circ} 8' 42.23$	343-0	-36.78	-17.24
Feb. 1.57647	"	$321^{\circ} 48' 9.28$		345	-45.36	
1.57647	"	$321^{\circ} 48' 16.62$		343	-38.02	
2.32352	Cape	$322^{\circ} 10' 51.71$	$58^{\circ} 19' 42.48$	342	-44.52	-9.14
2.33020	"	$322^{\circ} 11' 5.56$	$58^{\circ} 19' 46.24$	342	-42.84	-10.37
2.58642	Santiago	$322^{\circ} 18' 45.70$	$58^{\circ} 21' 28.47$	345-8	-50.20	-13.82
2.58642	"	$322^{\circ} 18' 48.15$	$58^{\circ} 21' 37.72$	344	-47.75	-23.07
3.31838	Cape	$322^{\circ} 41' 10.40$	$58^{\circ} 26' 5.90$	344	-42.29	-7.89
3.32531	"	$322^{\circ} 41' 20.64$	$58^{\circ} 26' 8.90$	344	-44.73	-8.19
3.58027	Santiago	$322^{\circ} 48' 55.33$	$58^{\circ} 27' 50.85$	346-7	-21.99	-10.99
4.31867	Cape	$323^{\circ} 11' 35.16$	$58^{\circ} 32' 36.46$	346	-47.76	-8.12
4.32665	"	$323^{\circ} 11' 48.53$	$58^{\circ} 32' 39.42$	346	-49.00	-7.96
4.56046	Santiago	$323^{\circ} 18' 56.08$		346	-49.82	
5.32129	Cape	$323^{\circ} 42' 16.59$	$58^{\circ} 39' 12.94$	349	-44.69	-9.73
5.33415	"	$323^{\circ} 42' 44.72$	$-58^{\circ} 39' 20.67$	349	-40.20	-12.37

Paris M. T. of Observation. 1859.	Place of Observation.	α	δ	Number of Comp. Star.	$\Delta \alpha$	$\Delta \delta$
Feb. 5.55918	Santiago	323° 49' 20".06	—58° 41' 2".20	350—45	—57".99	—24".75
7.56469	"	324 50 58.45		351	—50.91	
8.32536	Cape	325 14 25.25	58 59 18.46	351	—48.58	— 9.06
21.32089	"	332 1 46.90	60 33 49.94	352	—47.86	— 9.99
21.32628	"	332 1 58.20	60 33 54.71	352	—46.92	—12.23
21.54674	Santiago	332 8 57.59	60 35 35.05	356—3	—50.79	— 9.39
22.32145	Cape	332 33 54.08	60 41 44.39	354	—44.30	—14.10
22.54558	Santiago	332 40 56.92	60 43 7.19	356—5	—53.32	— 9.13
23.54858	"	333 13 31.86		353	—35.53	
24.54393	"	333 45 32.03	60 59 13.05	353	—44.85	+ 0.85
25.31888	Cape	334 10 43.88	61 5 46.15	357	—40.53	—15.09
25.32777	"		61 5 50.04	357		—14.63
26.30820	"	334 42 49.77	61 13 52.40	358	—45.94	—15.06
26.31610	"	334 43 6.12	61 13 56.77	358	—45.04	—15.52
27.31914	"	335 15 56.44	61 22 17.03	359	—40.83	—17.15
28.32881	"	335 48 59.67	61 30 48.03	360	—45.06	—20.45
Mar. 1.30403	"	336 21 4.81	61 39 5.74	361	—47.70	—22.22
1.31416	"	336 21 25.32	61 39 5.96	361	—47.26	—17.26
1.53531	Santiago	336 28 34.91		360	—54.24	
2.30038	Cape	336 54 6.52	61 47 32.30	362	—44.02	—16.36
2.30915	"	336 54 26.91	61 47 35.01	362	—41.08	—14.53
4.31626	"	338 1 22.54	—62 5 13.02	363	—37.19	—22.37

In the next place we proceed to the computation of the perturbations produced by the five large planets, from Venus to Saturn inclusive. The perturbations by Mercury were neglected, as, from the rapid motion of this planet, the intervals of time in the computation of the disturbing forces would require much reduction, with consequent increase of labor, while a rough estimate of the change produced in the comet's geocentric place showed it could not at any time much exceed 0".1. To render the integration possible it was necessary to adopt different intervals of time in the calculation of the disturbing force in different parts of the orbit; the near approach of the comet to Venus, in October, required them to be made as short as one day. The unit of time for the forces given below is however uniformly the same, being ten days. The unit of length is a unit in the seventh decimal place. The forces and perturbations belong to the usual system of rectangular equatorial co-ordinates; and the constants in the integration have been so taken, that the perturbations are the deviations of the comet from its osculating orbit of Oct. 2.

Washington Mean Noon. 1858.	<i>X</i>	<i>Y</i>	<i>Z</i>	δx	δy	δz
May 30	+ 2.282	— 4.081	— 2.414	+112.76	+ 59.52	—136.88
June 9	2.812	3.449	2.334	85.88	63.08	115.11
19	3.199	2.776	2.256	62.38	62.78	95.60
29	3.376	2.054	2.163	42.59	59.27	78.27
July 9	3.320	1.282	2.013	26.64	53.25	63.03
19	3.099	— 0.474	1.813	14.44	45.47	49.72
29	2.756	+ 0.333	1.613	5.76	36.72	38.15
Aug. 8	2.286	1.077	1.434	+ 0.23	27.74	28.12
18	1.697	1.712	1.295	— 2.58	19.26	18.99
28	0.998	2.180	1.210	3.23	11.88	11.91
Sept. 2	0.604	2.346	1.192	2.94	8.74	8.91
7	+ 0.195	2.420	1.197	2.38	6.04	6.29
12	— 0.200	2.432	1.235	1.69	3.82	4.11
17	0.564	2.340	1.326	0.99	2.11	2.38
22	0.831	2.148	1.534	0.43	0.91	1.11
27	0.898	1.914	1.929	0.10	0.22	0.30
Oct. 2	0.635	1.698	2.668	0.00	0.00	0.00
7	— 0.062	1.486	4.166	0.06	0.21	0.38
8	+ 0.123	1.346	4.829	0.08	0.30	0.56
9	0.322	1.149	5.643	0.10	0.40	0.79
10	0.621	0.883	6.837	0.12	0.51	1.08
11	1.163	0.561	8.706	0.14	0.63	1.43
12	2.122	0.264	11.645	0.14	0.76	1.88
13	3.894	0.286	16.416	0.12	0.89	2.43
14	7.326	1.587	24.376	— 0.07	1.02	3.16
15	14.196	7.291	37.424	+ 0.06	1.17	4.12
16	26.874	26.084	54.274	0.34	1.40	5.47
17	39.597	65.057	54.093	0.88	1.91	7.33
18	31.127	83.863	—16.538	1.80	3.06	9.70
19	12.813	60.792	+10.765	3.04	5.00	12.23
20	+ 2.934	36.632	15.493	4.41	7.54	14.67
21	— 1.001	22.390	13.417	5.82	10.45	16.95
22	2.572	14.485	10.690	7.23	13.58	19.08
27	3.790	2.506	3.916	14.00	30.47	28.37
Nov. 1	3.829	+ 0.055	2.246	20.22	47.65	36.45
6	3.789	— 1.173	1.496	25.87	64.25	43.91
16	3.605	2.718	0.744	35.42	94.40	58.03
26	3.216	3.816	0.312	42.52	119.44	72.07
Dec. 6	2.684	4.661	+ 0.029	47.26	138.61	86.62
16	2.065	5.287	— 0.158	49.93	151.42	102.02
26	1.410	5.714	0.268	51.01	157.58	118.44
1859.						
Jan. 5	0.766	5.957	0.309	51.07	156.92	135.99
15	— 0.174	6.037	0.286	50.67	149.42	154.69
25	+ 0.332	5.983	0.209	50.34	135.18	174.48
Feb. 4	+ 0.723	5.831	— 0.092	50.56	114.40	195.30
14	0.985	5.616	+ 0.053	51.67	87.37	217.00
24	1.115	5.377	0.205	53.90	54.41	239.42
Mar. 6	+ 1.117	—5.149	+ 0.353	57.35	+ 15.84	262.41
16				+ 61.99	— 28.03	—285.79

In forming the normals, the following system of weights was used ; the weight being given, not to each observation as published by the observer, but to the result of all

the observing in a single night with one comparison star, or with all the stars when they were compared with a single observation of the comet.

The Weight 4 to	The Weight 3 to	The Weight 2 to	The Weight 1 to
Ann Arbor,	Berlin,	Cambridge, Eng.,	Altona,
Bonn,	Cambridge, U. S.,	Christiania,	Armagh,
Cape 1,	Geneva,	Durham,	Batavia,
Greenwich,	Königsberg,	Santiago, Filar Microm.,	Breslau,
Kremsmünster,	Paris,	Vienna,	Copenhagen,
Liverpool,	Göttingen.	Leyden,	Florence,
Pulkova, Mer. Obs.		Pulkova, Ring Microm.,	Markree,
		Cape 2.	Padua,
			Washington,
			Santiago, Ring Microm.

An examination of the Santiago Ring Micrometer Observations shows that when the comet was observed in the northern half of the ring the resulting place is too far to the north, and when in the southern half too far to the south; which is to be explained by a personal equation in estimating the time of ingress and egress of the comet. I have endeavored to eliminate this source of error by applying a constant correction to the declinations obtained from the northern half of the ring, and the same with a contrary sign to those obtained from the southern half. A comparison of the observations gives $\mp 14''.85$ for this correction. To the right ascensions it appears necessary to add the quantity $+2''.35$ sec. δ : this was obtained by a comparison with the Cape observations. The normals for convenience are reduced to the nearest Washington Mean Noon, equivalent to $0^d.220526$ Paris Mean Time.

		App. α	App. δ	Cor. to Comp. Ephem.		Normal formed from Observations between
				$\Delta \alpha$	$\Delta \delta$	
1858.	June 14	141° 24' 27.15	+25° 4' 45.26	— 2.98	— 5.78	June 7 — June 19
	July 13	144 32 38.66	27 47 54.78	— 2.23	+ 0.62	June 28 — July 31
	Aug. 11	151 16 58.36	30 57 14.37	— 4.89	+ 5.48	Aug. 4 — Aug. 16
	Aug. 23	155 31 25.80	32 43 18.71	— 6.25	+ 8.59	Aug. 17 — Aug. 28
	Sept. 5	162 9 37.57	34 58 27.81	— 8.42	+12.96	Aug. 30 — Sept. 11
	Sept. 17	172 46 57.63	36 27 32.59	—12.67	+14.44	Sept. 12 — Sept. 22
	Sept. 28	192 7 59.94	32 26 23.74	—12.43	+14.21	Sept. 23 — Oct. 3
	Oct. 8	221 13 0.02	+10 44 14.24	— 5.19	+ 8.99	Oct. 4 — Oct. 14
	Oct. 19	250 27 5.84	—23 43 25.28	+ 0.41	+ 0.50	Oct. 15 — Oct. 25
	Nov. 1	269 34 10.88	41 1 15.00	— 7.15	+ 3.30	Oct. 26 — Nov. 7
	Nov. 16	281 48 26.58	48 4 54.63	—16.49	+ 4.70	Nov. 9 — Nov. 22
	Dec. 1	290 37 35.66	51 24 31.43	—25.62	+ 5.38	Nov. 24 — Dec. 6
	Dec. 16	298 22 14.09	53 28 43.21	—34.40	+ 2.16	Dec. 8 — Dec. 24
1859.	Jan. 3	307 15 6.95	55 21 28.01	—40.33	+ 0.54	Dec. 27 — Jan. 13
	Jan. 30	320 36 49.56	58 0 1.20	—44.14	— 6.47	Jan. 20 — Feb. 8
	Feb. 26	334 40 0.58	—61 13 10.20	—43.65	—16.18	Feb. 21 — Mar. 4

The following remarks must be made with regard to the composition of these normals.

June 14. The right ascension is the mean of four Berlin observations; the rest are so discordant that no confidence can be placed in them.

July 13. This normal is formed from the Berlin, Cambridge, and Ann Arbor observations, the others being rejected. The Washington observations, although more concordant at this time than they are generally, yet differ from the observations which should be considered the best, and on trial it has proved impossible to satisfy them along with the other normals.

Oct. 19. The right ascension of this normal has proved most refractory; when formed from all the material, it could not possibly be represented within $2''.5$, and much experimenting showed that a curve drawn through the adjacent normals would leave this one distant from it by about that quantity. This difference seeming altogether too large to be admitted in a normal having so much weight, some means must be adopted for ameliorating it.

As a more careful scrutiny of the observations showed that those made with small telescopes, especially those made at the Cape with the small instrument, had produced this deviation, I reluctantly set them aside; and the right ascension given above is the result of the Berlin, Bonn, Cambridge, U. S., and Ann Arbor observations.

By subtracting the reductions given below we obtain the co-ordinates of the comet referred to the mean equinox and equator of 1858.0, and freed from perturbations.

		Aberration.		Reduction from 1858.0.		Perturbations.			
		$\Delta \alpha$	$\Delta \delta$	$\Delta \alpha$	$\Delta \delta$	$\Delta \alpha$	$\Delta \delta$	α 1858.0	δ 1858.0
1858.	June 14	— $2''.20$	— $5''.26$	+ $31''.32$	— $3''.43$	— $0''.86$	— $0''.71$	141° 23' 58.89	+ 25° 4' 54.66
	July 13	8.58	4.72	37.80	5.93	0.51	0.47	144 32 9.95	27 48 5.90
	Aug. 11	13.36	5.78	43.55	9.07	0.26	0.28	151 16 28.43	30 57 29.50
	Aug. 23	15.79	6.25	45.52	10.68	0.16	0.19	155 30 56.23	32 43 35.83
	Sept. 5	20.37	5.51	47.12	12.86	0.10	0.12	162 9 10.92	34 58 46.30
	Sept. 17	28.74	— 0.22	47.06	15.65	0.04	0.05	172 46 39.35	36 27 48.51
	Sept. 28	38.30	+ 15.97	43.23	18.90	0.00	0.00	192 7 55.01	32 26 26.67
	Oct. 8	35.41	38.05	40.05	19.27	— 0.01	0.02	221 12 55.39	+ 10 43 55.48
	Oct. 19	27.95	30.56	48.53	14.35	+ 0.04	0.42	250 26 45.22	— 23 43 41.07
	Nov. 1	22.57	15.90	60.30	8.58	0.52	1.17	269 33 32.63	41 1 21.15
	Nov. 16	20.43	9.26	69.54	— 3.84	1.11	1.41	281 47 36.36	48 4 58.64
	Dec. 1	21.23	6.56	76.45	+ 0.11	1.53	1.43	290 36 38.91	51 24 36.67
	Dec. 16	23.27	5.43	82.19	3.83	1.79	1.38	298 21 13.38	53 28 51.09
1859.	Jan. 3	26.29	5.16	88.00	8.24	1.92	1.23	307 14 3.32	55 21 40.18
	Jan. 30	30.51	6.31	94.21	14.70	1.72	0.94	320 35 44.14	58 0 21.27
	Feb. 26	— 35.09	+ 8.86	+ 96.56	+ 20.85	+ 0.90	— 0.61	334 38 58.21	— 61 13 39.30

In forming equations of condition from these normals, it will be advantageous to use residuals from elements nearer the truth than those of Searle. The following elements, computed from three provisional normals, embracing the whole period of the comet's apparition, will serve this purpose.

$$\begin{aligned}
 T &= 1858, \text{ Sept. } 29.971007, \text{ Paris Mean Time.} \\
 \left. \begin{aligned} \omega &= 129^\circ 6' 39''.40, \\ \Omega &= 165^\circ 19' 10.67, \\ i &= 116^\circ 58' 10.87, \end{aligned} \right\} \text{Mean Equinox and Ecliptic, 1858.0.} \\
 \varphi &= 85^\circ 2' 43.72, \\
 \log q &= 9.7622760, \\
 \log a &= 2.18982, \\
 P &= 1926^y.3.
 \end{aligned}$$

The places of the Sun used will be taken from Hansen and Olufsen's *Tables du Soleil*, substituting, however, the Pulkova constants of nutation and aberration. A comparison of the Greenwich observations of the Sun, for 1858–59, shows a pretty good representation of observation by these tables. And the small differences that remain may be much modified by the introduction of corrections peculiar to the observer and the instrument. And knowing the difficulty that attends the consideration of this matter, I do not propose to inquire further into it.

The following are the equations of condition that result from the above normals. The logarithms of the coefficients are given instead of the coefficients themselves, and the variations of the elements are supposed to be expressed in seconds of arc, $0^{\text{d}}.0001$ in δT being equivalent to $1''$, and 0.00001 in $\delta \log q$ and δe ; the right-hand members are $\Delta a \cos \delta$ and $\Delta \delta$.

Equations from the Right Ascensions.

											Weight.		
-9.8662	$\delta \log q$	+9.3875	δe	+8.7810	δT	-9.2176	$\delta \omega$	-9.2190	δi	+9.8566	$\delta \Omega$	= +1.17	0.12
-9.8551		+9.0785		+8.7925		-9.2008		-9.3646		+9.7651		= +0.92	0.36
-9.8000		+8.5855		+8.7743		-9.1247		-9.5208		+9.6436		= +0.18	0.62
-9.7273		+8.2393		+8.7146		-9.0325		-9.5931		+9.5496		= +0.75	0.70
-9.4914		-7.3061		+8.3722		-8.7217		-9.6767		+9.3190		= +1.63	1.73
+9.1499		-8.3465		-8.8318		+8.7980		-9.7498		-8.6312		= +0.55	2.57
+9.9901		-8.1188		-9.4913		+9.4492		-9.7556		-9.6671		= +0.33	2.09
+0.3761		+9.1757		-9.7442		+9.5448		-9.4468		-9.8318		= +0.38	2.27
+0.4981		+9.5597		-9.4693		-9.1112		+7.5105		-8.7024		= +2.07	1.19
+0.4498		+9.6413		-8.7919		-9.6233		-8.8691		+9.5399		= +1.58	0.79
+0.3823		+9.6892		+7.8946		-9.6984		-9.2986		+9.6547		= +2.71	0.72
+0.3199		+9.7175		+8.3883		-9.5057		-9.4785		+9.6702		= +2.99	0.46
+0.2584		+9.7263		+8.4389		-9.6900		-9.5929		+9.6637		= +2.24	0.62
+0.1787		+9.7084		+8.4115		-9.6505		-9.6946		+9.6418		= +2.43	0.60
+0.0237		+9.6084		+8.3032		-9.5379		-9.8103		+9.5822		= +2.44	0.67
+9.7381		+9.2739		+8.1126		-9.2732		-9.8974		+9.4698		= +0.10	0.41

Equations from the Declinations.

												Weight.	
+0.4299	$\delta \log q$	+9.8023	δe	-8.9052	δT	+9.9005	$\delta \omega$	-8.6591	δi	-9.2630	$\delta \Omega$	= +4.59	0.29
+0.4008		+9.6194		-8.9529		+9.8126		-8.7826		-9.2068		= +3.61	0.47
+0.4014		+9.3636		-9.0475		+9.7291		-8.8411		-9.2140		= +1.61	0.60
+0.4094		+9.1945		-9.0967		+9.6871		-8.8276		-9.2258		= +1.72	0.70
+0.4223		+8.9104		-9.1314		+9.6160		-8.7090		-9.2238		= +2.81	1.71
+0.4444		+8.5223		-8.9832		+9.4363		+7.0656		-9.0928		= +2.21	2.57
+0.5294		+7.9961		+9.2695		-9.1089		+9.0218		+9.0810		= +1.00	2.04
+0.6902		-9.1747		+9.9580		-9.9980		+8.5811		+9.7179		= +0.25	2.24
+0.6299		-9.4551		+9.8831		-9.9774		+8.1283		-8.3321		= -1.12	1.15
+0.4712		-9.1778		+9.5374		-9.7775		+9.3709		-9.3505		= -0.40	0.79
+0.3824		-8.4943		+9.2865		-9.7031		+9.5341		-9.1944		= +0.26	0.72
+0.3437		+8.7707		+9.1361		-9.6986		+9.5768		-8.8537		= +1.90	0.44
+0.3297		+9.1485		+9.0385		-9.7200		+9.5823		+7.6943		= +0.53	0.62
+0.3304		+9.3778		+8.9605		-9.7595		+9.5616		+8.9410		= +2.06	0.60
+0.3495		+9.6005		+8.8879		-9.8280		+9.4755		+9.3028		= +1.97	0.60
+0.3754		+9.7620		+8.8403		-9.8951		+9.2523		+9.4895		= +1.68	0.39

The operations were carried through with logarithms of five decimal places, the want of breadth in the page has compelled the omission of the last figure in the above coefficients. The resulting normal equations are —

+211.720	$\delta \log q$	+6.2418	δe	+9.9751	δT	-16.7517	$\delta \omega$	-0.8780	δi	+1.5523	$\delta \Omega$	-81.633	=0
+ 6.2418		+1.8262		-0.9109		- 0.0865		-0.6452		+0.4804		- 9.5672	=0
+ 9.9751		-0.9109		+3.8401		- 4.1916		+1.0919		+2.3800		+ 2.7880	=0
- 16.7517		-0.0865		-4.1916		+ 7.2621		-0.8845		-3.3057		- 0.5563	=0
- 0.8780		-0.6452		+1.0919		- 0.8845		+3.5740		+0.0632		+ 5.3321	=0
+ 1.5523		+0.4804		+2.3800		- 3.3057		+0.0632		+3.6073		- 2.6113	=0

The solution of these gives, —

$$\delta \log q = +0.44, \quad \delta e = +2.99, \quad \delta T = -0.36, \quad \delta \omega = +1.81, \quad \delta i = -0.32, \quad \delta \Omega = +2.04.$$

And the sum of the squares of the residuals is reduced from 87.378 to 13.547, making the probable error of a normal of the weight unity, $\pm 0''.487$; adopting this value, the elements with their probable errors are (which elements it will be remembered are the osculating of Oct. 2): —

$T = 1858, \text{ Sept. } 29.970971 \pm 0^d.0000860$ Paris Mean Time.			
$\omega = 129^\circ 6' 41''.21$	$\pm 0''.348$	} Mean Equinox and Ecliptic 1858.0	
$\Omega = 165 19 12.71$	± 0.611		
$i = 116 58 10.55$	± 0.290		
$\varphi = 85 3 55.22$	$\pm 19.10''$		
$\log q = 9.7622804$	± 0.000000616		
$\log a = 2.19331$			
$P = 1949.7 \text{ years.}$	± 67.25		

The normals are represented by these elements with the following residuals, (Obs. — Cal.)

	$\Delta \alpha \cos \delta$	$\Delta \delta$		$\Delta \alpha \cos \delta$	$\Delta \delta$
June 14	—0''.43	+0''.39	Oct. 19	—0''.17	—0''.11
July 13	—0.07	+0.35	Nov. 1	—0.96	+0.49
Aug. 11	—0.40	—0.89	Nov. 16	+0.11	+0.70
Aug. 23	+0.30	—0.49	Dec. 1	+0.39	+1.97
Sept. 5	+1.23	+0.93	Dec. 16	—0.32	+0.27
Sept. 17	+0.32	+0.60	Jan. 3	+0.00	+1.42
Sept. 28	+0.08	—0.44	Jan. 30	+0.41	+0.73
Oct. 8	—0.66	—0.39	Feb. 26	—1.21	—0.22

These residuals, although they appear quite small, do not indicate a completely satisfactory solution. For the probable error derived from them is much larger than that obtained from the consideration of the observations themselves. The latter quantity being $\pm 0''.27$, while the former, as stated above, is $\pm 0''.487$. The principal cause of this difference is doubtless to be sought in the small systematic errors of the observations which arise from the idiosyncrasy of the observer in selecting the proper point to be observed, influenced perhaps, in some degree by the size of the instrument he used. In Vol. III. p. 329, of the Annals of Harvard College Observatory, will be found the statement of the opinion that the observations have a tendency to place the comet too near the Sun, and the smaller the telescope the nearer the Sun. Let us see whether the observations confirm this supposition. Taking the comparisons in declination of the best observations which go to form our normal of Sept. 17, when the effect of such a tendency lies almost wholly in declination, and arranging them under the head of the different observatories and in the order of the size of the telescopes, we have the following table. The numbers beneath the names of the observatories denote the aperture of the telescope in inches.

	Ann Arbor. 12.5	Berlin. 9.6	Liverpool. 8.5	Königsberg. 6.25	Bonn. 6.0	Kremsmünster. 5.9	Pulkova. 5.8	Paris. 4.8	Geneva. 4.25
Sept. 12	+14.33	....	+15.63	+22.06	+13.93	+14.42	+13.41	+17.28	+10.28
13	+14.72	+13.93	....	+12.59	....	+15.48	....	+19.45	+15.92
14	....	....	....	+13.57	....	+13.63	....	+17.69	+12.28
15	....	+16.04	+16.06	+21.30	....	....	....	....	+ 7.63
16	+14.47	....	....	+10.53	+11.66	+15.72	+11.15	....	....
17	+16.65	....	....	+18.84	....	+16.64	+14.35	....	....
18	+17.32	....	+12.06	+10.13	....	....	+ 9.83	+25.92	....
19	+12.55	....	....	....	....	+17.81	....	+ 7.51	+13.14
20	+14.10	+13.48	....	....	....	+13.83	....	+13.09	....
21	....	+15.17	+18.13	+11.08	+14.28	....	....	....	+18.35
22	....	....	....	....	+12.90	+15.55	....	....	....
Mean,	+14.88	+14.66	+15.47	+15.01	+13.19	+15.39	+12.19	+16.82	+12.93

The existence of systematic error seems pretty well made out between the different observatories; and the Bonn, Pulkova, and Geneva observations made with small telescopes, do certainly place the comet nearer the Sun than the others. But the observatory which places the comet farthest to the north is Paris, with a very small telescope. Also Kremsmünster and Königsberg, with much smaller telescopes, put the comet farther from the Sun than Ann Arbor and Berlin. These facts militate strongly against this supposition. The quantity used in forming the normal was $+14''.44$, and the preceding elements give $+13''.84$ for the same quantity, from which it may be judged how well each of the above observations is satisfied.

Again, if this hypothesis were sufficient to account for the systematic errors, we should have almost perfect agreement in the right ascensions. Let us see whether this was the case.

	Ann Arbor.	Berlin.	Liverpool.	Königsberg.	Bonn.	Kremsmünster.	Pulkova.	Paris.	Geneva.
Sept. 12	— 7.62	....	—11.69	— 7.21	—13.13	—10.38	—18.72	— 4.79	— 9.74
13	—11.36	—18.00	....	— 9.26	....	—12.00	....	— 9.48	—14.06
14	....	....	....	— 7.87	....	— 6.96	....	— 9.41	— 9.83
15	....	—17.88	— 8.83	—11.24	....	....	....	....	—16.48
16	—14.63	....	....	—12.52	— 7.51	—10.77	—10.14	....	....
17	—13.47	....	....	—13.64	....	—15.02	—13.25	....	....
18	—13.13	....	—11.09	— 5.55	....	....	—10.07	—15.38	....
19	—17.26	....	....	....	....	—13.13	....	—18.14	—15.42
20	—16.22	— 9.98	....	....	....	—10.89	....	—20.02	....
21	....	—11.95	— 9.02	— 9.39	—14.82	....	....	....	— 8.18
22	....	....	....	....	—19.26	—12.99	....	....	....
Mean,	—13.38	—14.45	—10.16	— 9.59	—13.68	—11.52	—13.05	—12.87	—12.29

Systematic error, is not quite so manifest here as in the declinations, the observations not agreeing so well among themselves, but it undoubtedly exists in considerable quantity. The quantity used for the normal of Sept. 17 was $-12''.67$, and the orbit found gives $-13''.07$.

We shall make one more trial; about Oct. 8, the effect according to the hypothesis, took place wholly in the direction of right ascension. The scheme of observations stands thus:—

	Ann Arbor.	Paris. 12.6	Berlin.	Liverpool.	Königsberg.	Bonn.	Kremsmünster.	Pulkova.	Geneva.	Greenwich. 8.75
Oct. 4	.....	.....	-7.20	-2.82	.....	.....	.....	.....	-16.18	.....
5	-7.94$	.....	+1.71$	.....	-7.91	-7.65	.....	.....	-10.96	-9.49
6	.....	.....	-4.30	.....	.....	.....	-11.01	-10.98	-11.00	.....
7	.....	.....	-4.97	.....	.....	.....	-6.66	.....	-8.19	.....
8	.....	-2.80	.....	-8.49	.....	-4.85	-2.40	.....	.....	.....
9	-0.09	-4.29	.....	.....	-12.66	.....	.....	.....	-6.94	-0.68
10	.....	.....	.....	.....	.....	.....	-6.49	.....	.....	.....
11	.....	.....	.....	.....	.....	.....	-4.78	.....	.....	-2.05
12	.....	.....	.....	.....	.....	.....	.....	-4.17	.....	.....
13	-1.20$	.....	.....	+4.11$	.....	.....	.....	.....	-5.28	.....
14	$+5.45$	.....	.....	.....	.....	.....	-3.73	.....	-4.39	.....

The observations are too scattered to establish anything with certainty, but the systematic errors seem to be larger than before, and, Greenwich excepted, the observations with the small telescopes place the comet farther from the Sun than those with the large telescopes. The same thing is probably true of the observations of the rest of October, but as the northern observations here begin to fail us, we can make no comparison.

It would be very difficult, perhaps impossible, to arrive at a satisfactory explanation of these systematic errors and to assign their numerical values, consequently I shall not undertake any discussion of them. If, however, this hypothesis should be adopted, and a correction varying inversely as the size of the telescope should be applied to the observations, removing the comet from the Sun a space ranging from $1''$ to $3''$, the effect would be to diminish the period of revolution by about 25 or 30 years. With regard to this, the most interesting element of the orbit, we may state with confidence, I think, that it is not less than 1900 years, and cannot exceed 1975 years.

Lastly, we have settled by this discussion, that there is not the slightest indication that any other force than gravity influenced the motion of the centre of gravity of the comet. For although, on comparing our final orbit with observations made at a particular observatory, we should observe small but well-marked deviations, yet another observatory will be found, whose observations entitled to equal confidence indicate a deviation at the same time in an opposite direction.